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TUMOURS

INNOCENT AND MALIGNANT

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PLATE I.—"Fungating" Sebaceous Cyst (Sebaceous Adenoma) on the Scalp of a Woman 83 years of age. (*See page* 237.)

TUMOURS

INNOCENT AND MALIGNANT

Their Clinical Features and Appropriate Treatment

BY

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WITH TWO HUNDRED AND FIFTY ENGRAVINGS AND NINE PLATES

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PREFACE.

VERY early in the practice of my profession I became convinced of the great increase in diagnostic power that results from the combination of pathological and clinical knowledge. Imbued with this belief, I formed, eight years ago, the intention of writing a book on Tumours in which their clinical and pathological features should be equally considered. In 1885 I began to collect materials, from man and other vertebrates, in order to make myself acquainted with the histological peculiarities of tumours. The great difficulty was to define the boundaries of my subject. In order to do this I determined to eliminate all those conditions, often classed with tumours, which have been demonstrated to depend on micro-organisms. This cleared the ground in a satisfactory manner. Attention was first devoted to cysts, and the results of the investigation were embodied in my Hunterian and Erasmus Wilson Lectures, delivered at the Royal College of Surgeons during the years 1886, '87, '88, '89, '90 and '91; they dealt particularly with the group of tumours known as Dermoids, and the genus of cysts which I have ventured to name Tubulo-cysts. During the same period I contributed to the Odontological Society of Great Britain a series of papers to show that many tumours of the jaws, vaguely classed as exostoses, are really derived from aberrant development of teeth.

In describing Cancer a wide departure is made from the beaten track. The terms scirrhus, colloid, and medullary or encephaloid, have dominated the minds of surgeons and hindered progress long enough. The term cancer is employed in a sense equivalent to malignant adenoma, the species being determined by the gland in which the cancer arises.

Whenever it seemed desirable to illustrate the nature of a genus of tumours by reference to Comparative Pathology, I have not hesitated to do so. Without this aid, any attempt

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to catch the deeper meaning of many tumours is as difficult as endeavours to decipher a palimpsest in which the first characters, written in an unknown tongue, have been imperfectly removed from the parchment and are allowed to mingle with the second inscription.

In describing treatment it would obviously be out of place to give the details of operations in a work of this kind, so I have contented myself by indicating the principles.

In selecting the figures every effort has been made to avoid depicting repulsive conditions. To-day surgeons are much more interested in studying the Biology of Tumours than in recording their weight. As the Surgery of Tumours is far safer than in the first half of this century, patients, now thoroughly aware of this, submit to operations at an early date. The more this is recognised, and the more generally the impotence of drugs when employed against tumours is realised, the more successful will the Surgery of Tumours become.

I have to thank Mr. T. Carwardine for kindly reading the proof-sheets, Mr. C. Berjeau for his excellent drawings, and Mr. C. Butterworth for many admirable examples of wood-engraving.

In a systematic work of this kind it follows that, in order to find descriptions of the various tumours to which an organ is liable, the reader must refer to different sections of the book. To minimise this disadvantage I have made two special indexes—one showing the tumours to which an organ is liable, and the other indicating the distribution of tumours among the organs; hence these constitute a syllabus rather than a mere Index.

J. BLAND SUTTON.

48, Queen Anne Street,
Cavendish Square, W.
October, 1893.

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TUMOURS

INNOCENT AND MALIGNANT:

Their Clinical Characters and Appropriate Treatment.

CLASSIFICATION.

Any thoughtful individual, on commencing the study of tumours, must doubtless have been struck by the confusion which prevails in oncological literature in regard to the use of such terms as classes, groups, species, varieties, etc. This confusion will be more obvious if the student be acquainted even in a moderate degree with Systematic Zoology. Not that the zoologist can in any way claim to have discovered a perfect method of classification, but he certainly uses the terms genus, species, etc., in a consistent manner.

In the present work an attempt will be made to classify tumours on similar lines to those employed in Biology. The classification adopted is one which will not, in any serious way, involve the Taxonomy (if it be worth such a name) at present in fashion.

It is certain that the efforts of J. Müller (1838) to classify tumours according to their minute structure had a great influence in promoting the study of Oncology. Virchow's labours on the histology of tumours, and especially his success in demonstrating that all the tissues found in them have a physiological prototype, have made it plain that it is impossible, in any useful classification of tumours, to neglect to take into consideration their structural characters.

To-day it must be clear to all who study Virchow's great work, "Die Krankhaften Geschwülste" (1863), in the light of our present knowledge that he employed the term tumour in a

too comprehensive manner. It is highly desirable to exclude from tumours those formations known as *infective granulomata,* and there can be no doubt that this group will be largely increased in the near future, as it has been in the recent past, at the expense of sarcomata and, in all probability, of the epitheliomata and carcinomata, as our knowledge of the biology of micro-organisms increases.

Tumours may be arranged in four groups :—

I. Connective tissue tumours.
II. Epithelial tumours.
III. Dermoids.
IV. Cysts.

Each group contains several genera ; each genus has one or more species ; of each species there may be one or more varieties.

CHAPTER I.

GROUP I.—CONNECTIVE TISSUE TUMOURS.

The Connective Tissue Group of tumours contains the following genera :—

1. Lipomata (fatty tumours).
2. Chondromata (cartilage tumours).
3. Osteomata (osseous tumours).
4. Odontomata (tooth tumours).
5. Fibromata (fibrous tumours).
6. Myxomata.
7. Gliomata (neuroglia tumours).
8. Sarcomata.
9. Myomata (muscle tumours).
10. Neuromata (tumours on nerves).
11. Angeiomata (tumours composed of blood-vessels).
12. Lymphangeiomata (tumours of lymphatic vessels).

LIPOMATA (FATTY TUMOURS).

A **Lipoma** is a tumour composed of fat. The various species of this genus, determined mainly by the situations in which they arise, are : 1, Subcutaneous ; 2, subserous ; 3, subsynovial ; 4, submucous ; 5, intermuscular ; 6, intramuscular ; 7, parosteal ; 8, meningeal.

1. **Subcutaneous Lipomata.**—Beneath the skin there exists a layer of fat, which varies in thickness in different parts, but is most abundant over the trunk and trunk ends of the limbs. This subcutaneous fat is a common situation in which to find lipomata. Usually they occur as irregularly lobulated encapsuled tumours, more or less adherent to the skin. Unless they have been irritated, lipomata are movable within their capsules. Generally one lipoma is present, but two, ten, twenty, or more may occur concurrently on the same individual. In size they vary widely ; a lipoma weighing sixteen ounces is a tumour of fair size ; exceptional specimens have been reported to weigh fifty, eighty, and even one hundred pounds. Although subcutaneous lipomata are for the most part confined to the trunk and trunk ends of limbs, they may arise on the distal

parts of the limbs, such as the hands and feet. Many specimens have been observed in the palm of the hand (Fig. 1), a situation in which they are apt to give rise to difficulty in diagnosis, more especially as they simulate compound ganglia of the flexor tendons. The lobes of fat are apt to burrow beneath the palmar fascia, and it is probable that some lipomata of the palm originate beneath this fascia, in the lobules

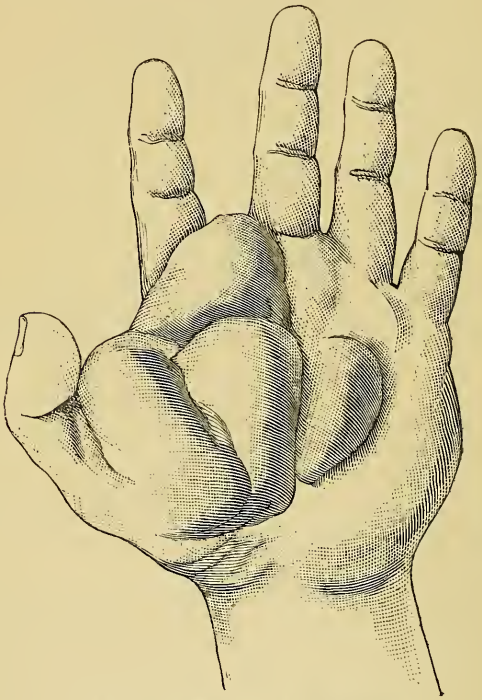

Fig. 1.—Lipoma in the palm of the hand.

of fat lying between the lumbricales. Fatty tumours are occasionally found on the fingers: Steinheil* has collected a large number of examples. A lipoma in the sole of the foot is more comprehensible than one in the palm of the hand, yet, strange to relate, they are far more frequent in the hand than in the foot; in both situations they are apt to be congenital.†

* Bruns, *Beiträge*, bd. vii. 605.

† Gay, Trans. Path. Soc., vol. xiv. 243, and Lockwood, *ibid.*, vol. xxxvii. 450.

Subcutaneous lipomata are often symmetrical (Fig. 2) and are apt to become pedunculated, especially when growing from the thigh. Pedunculated lipomata are never very large, and when the pedicle is thin it will become twisted by the rotatory movements of the tumour, the growth of which will in consequence be arrested, or at least checked.

Fatty tumours are rarely met with upon the head or face,

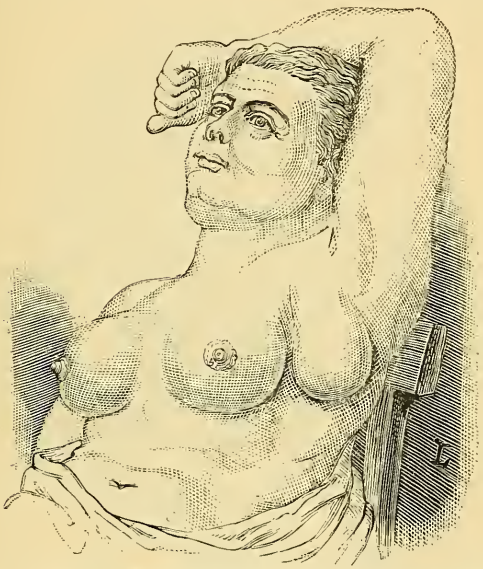

Fig. 2.—Lipoma of the left axilla; a similar tumour occupied the right axilla.

but I have on three occasions removed a lipoma from beneath the skin covering the temporal fascia: the largest specimen is depicted in Fig. 3.

There is a variety known as the diffuse lipoma; in typical cases the tumours appear as symmetrical swellings in the neck and on each side of the ligamentum nuchæ. The fat has a coarsely granular appearance, due to being bound up in tiny lobules, which causes it to resemble omentum. In the neck these collections of fat are situated on the deep as well as the superficial aspect of the platysma muscle. Similar unencapsuled masses of fat occur in the groin, pubic region, and axillæ of those who are unfortunate enough to possess them in the neck (Fig. 4).

There is a variety of fatty tumour sometimes called, on account of its vascularity, *nævo-lipoma;* some are of opinion that it is a nævus which has undergone fatty degeneration. Possibly some of the vascular lipomata met with on the face have this origin.

2. **Subserous Lipomata.**—The peritoneum, like the skin, rests upon a bed of fat, the thickness of which varies considerably. As in the case of subcutaneous lipomata, those which

Fig. 3.—Lipoma superficial to the temporal fascia.

occur in the subserous tissue may be sessile, pedunculated, or diffuse.

Surgeons have long been aware, in operating for inguinal or femoral hernia, that occasionally they come across a mass of fat, and find difficulty in determining whether it be omental or a local increase of the subserous fat surrounding the hernial sac. It is now clear that in the neighbourhood of the femoral and inguinal canals an overgrowth of the subserous fat may occur and be mistaken for a hernia, and individuals have been recommended to wear, and have actually worn, trusses for fatty tumours of this character. It is also clear that as these

local overgrowths of fat arise and protrude in the groin, they occasionally draw with them a pouch of peritoneum unassociated with a hernia. These pouches may afterwards lodge a piece of gut, and become true hernial sacs. Thus peritoneal pouches, produced mechanically by subserous lipomata, may subsequently become hernial sacs; on the other hand, lipomata may arise in relation with peritoneal pouches which were

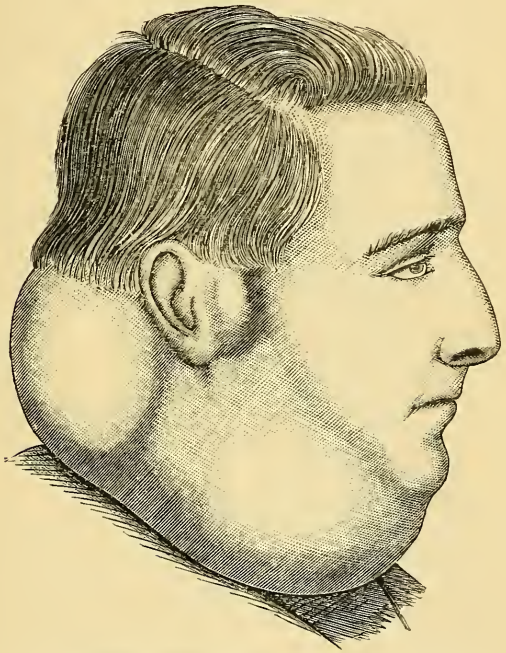

Fig. 4.—Diffuse lipoma of the neck. (*After Morrant Baker.*)

originally hernial sacs. In some cases a subserous lipoma of this character will invaginate a peritoneal pouch and form a pedunculated tumour within the hernial sac. Fatty tumours sometimes arise in the scrotum or labium without being connected with hernial pouches.*

Lipomata arising in the subperitoneal tissue occasionally appear in the anterior abdominal wall, especially near the umbilicus; they are sometimes referred to as "fatty herniæ of the

* J. Hutchinson, jun., Trans. Path. Soc., vol. xxxvii. 451 and vol. xxxix., gives a good account of hernial lipomata.

linea alba," and are frequently associated with peritoneal pouches. These lipomata simulate hernia still further when the traction they exercise on the peritoneum causes pain. Subserous lipomata on the under surface of the diaphragm may pass upwards into the mediastinum through the space which exists behind the ensiform cartilage.

A few cases are known in which lipomata have grown between the layers of the broad ligament;* in one case the tumour was so large as to simulate an ovarian tumour.†

Enormous subserous lipomata, in many respects resembling the diffuse tumours of the subcutaneous tissue, have been described. Pick‡ recorded a case in which a mass of fat weighing thirty pounds was found posterior to the transverse colon. Meredith§ successfully removed an omental lipoma weighing fifteen pounds and a half from a woman sixty-two years old; the operation was undertaken because the tumour was thought to be ovarian. Cooper Forster‖ met with a similar tumour, weighing fifty-three pounds, in a woman sixty-three years old.

Hernial lipomata are interesting, for they explain the mode in which appendices epiploicæ arise: they are localised pedunculated overgrowths of subserous fat, and are particularly large and arborescent in the neighbourhood of an old syphilitic stricture of the rectum.

In well-nourished individuals the fat of the appendices epiploicæ is directly continuous with the fat in the layers of the mesentery; when wasting occurs the fat between the appendices and the mesentery is liable to atrophy and leave an adipose nodule at the bottom of a peritoneal pouch (Fig. 5). The movements of the intestine and the traction of the nodule lead to the formation of a pedicle which often becomes twisted; sometimes the pedicle is so thin that it breaks, and the appendix is set free. Pieces of fat, not infrequently calcified, detached in this way, have been found in hernial sacs.

Pedunculated lipomata of the colon are not uncommon in

* Parono, *Ann. di Ostet. Milano*, 1891, xiii. 103, pl. 1.
† Treves, Trans. Clin. Soc., vol. xxvi.
‡ Trans. Path. Soc., vol. xx. 337.
§ Trans. Clin. Soc., vol. xx. 206.
‖ Trans. Path. Soc., vol. xix. 246.

horses and oxen: I have known them weigh two pounds; they are apt to cause invagination of the bowel.

3. **Subsynovial Lipomata.**—Beneath the subserous tissue of large joints, such as the knee, there is a layer of fat of varying thickness. This fat may, as in the case of inguinal lipomata, increase in quantity and, projecting into the joint, form a fatty tumour. A common situation for this to occur is beside the patella, at the spot normally occupied by the alar ligaments.

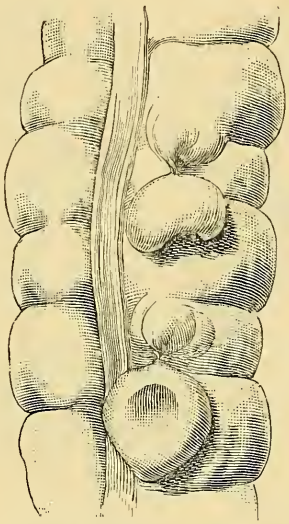

Fig. 5.—Small pendulous appendices epiploicæ, with twisted pedicles, of the ascending colon.

Many specimens are doubtless due to overgrowth of the fat in the alar fringes, but they may arise in other parts of the joint.

The best known variety of subsynovial fatty tumour is that to which Müller applied the term "lipoma arborescens." This condition is often, but by no means always, associated with rheumatoid arthritis. A typical specimen from the shoulder-joint is represented in Fig. 6, consisting of small finger-like processes of fat projecting into the cavity of the joint; each process is covered by synovial membrane. The lipoma arborescens bears precisely the same relation to the synovial membrane that the appendices epiploicæ bear to the peritoneal investment of the colon and sigmoid flexure.

4. **Submucous Lipomata.**—Fat exists in the submucous tissue in many situations and, like that in the subcutaneous tissue, is not infrequently the source of lipomata. Thus Virchow* has figured a fatty tumour situated beneath the mucous membrane of the stomach, near the pylorus: it was as big as a nut. They also grow from the jejunum and hang as

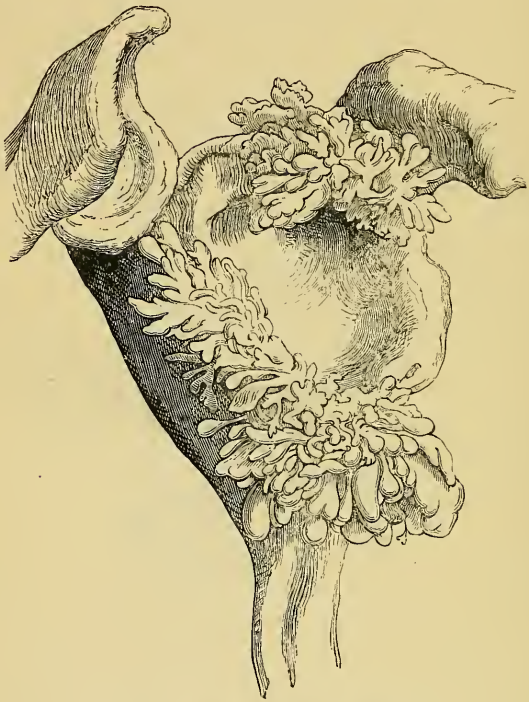

Fig. 6.—Lipoma arborescens of the shoulder.

pedunculated tumours in the gut, and have caused intussusception.

Laryngeal lipomata are rare. One of the most remarkable examples was described by Holt.† The patient, a man, died suddenly: hanging from the left aryteno-epiglottic fold and from the side of the epiglottis was a pedunculated tumour, which extended into the œsophagus to a distance of

* "Krank. Geschwülste," bd. i. 372.

† Trans. Path. Soc., vol. xxxii. 243.

22·5 cm. (9″). It consisted of fat covered with mucous membrane.

Sydney Jones* removed a lipoma from the right arytenoepiglottic fold of a man forty years old: it was 5 cm. (2″) in diameter. The patient could protrude the tumour into his mouth. Bruns removed a lipoma the size of a hazel nut from the right arytenoid region.

Subconjunctival lipomata occasionally occur near the point where the conjunctiva is reflected from the lower lid to the eyeball: they are almost confined to children. Sometimes lipomata arise from the orbital fat and project the conjunctiva in the neighbourhood of the lachrymal gland and near the insertions of the ocular muscles.

5. **Intermuscular Lipomata.**—Fatty tumours now and then arise in the connective tissue between muscles: they have been found between the greater and lesser pectorals, between the muscles of the tongue and the internuscular strata of the anterior abdominal wall. In the last-mentioned situation they have been known to attain prodigious proportions.†

The most remarkable variety of this species of lipoma arises in connection with the sucking-cushion. This curious ball of fat is situated between the masseter and buccinator muscles, and comes into close relation with the buccal mucous membrane. It is believed to play an important function in connection with sucking, by distributing atmospheric pressure and preventing the buccinators from being forced between the alveolar arches when a vacuum is created in the mouth. They are relatively much larger in infants than in adults. Ranke ‡ also points out that in emaciated children the cushions are only slightly diminished in size even when there is scarcely any subcutaneous fat. (Figs. 7 and 8.)

The sucking-cushions sometimes enlarge in adults, and simulate more serious species of tumours, and it is curious that in some of the recorded cases the enlargement of the cushion has been associated with the impaction of a salivary

* Trans. Path. Soc., vol. v. 123.

† Sir Astley Cooper, Medico-Chir. Trans., vol. xi. 440. Eve, Trans. Path. Soc., vol. xxxix. 295. Abdel-Fattah Fehmy, *Brit. Med. Journal*, 1893, vol. i. 459.

‡ Virchow's "Archiv," bd. xcvii. 527.

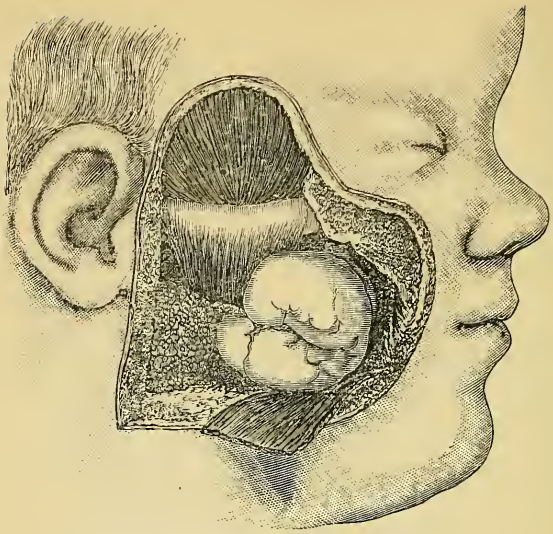

Fig. 7.—Enlarged sucking-cushion. (*After Ranke.*)

calculus in the duct of the parotid gland.* The association of an impacted salivary calculus and an enlarged sucking-cushion

Fig. 8.—Emaciated child crying and displaying the sucking-cushions. (*After Ranke.*)

* Berger, *Gaz. des Hôpitaux*, Nov. 15, 1883; and Owen, *Lancet*, 1890, vol. ii. 71.

is interesting in relation with an observation of Norman Moore, who found a large collection of fat around a ureter at the site of an impacted calculus. (Museum, Royal College of Surgeons, 196a.)

6. **Intramuscular Lipomata.**—Many examples of fatty tumours occurring in the midst of muscles have been reported, and are of interest from the trouble they cause in diagnosis. They have been found in the deltoid, biceps humeri, complexus, and rectus abdominis; in the muscular tissue of the heart, and in the middle of a submucous myoma of the uterus.*

7. **Parosteal Lipomata.**—This term has been applied to fatty tumours arising from the periosteum of bone. They are usually congenital, and nearly always contain tracts of striated muscle fibre. Some of these tumours are clinical puzzles. Dr. F. Taylor† reported a case in which a fatty tumour grew from the anterior surface of the bodies of the cervical vertebræ; it projected the posterior wall of the pharynx, and simulated a post-pharyngeal abscess. The patient was a girl four years old. I have removed parosteal lipomata from the dorsal surface of the infra-spinous fossa of the scapula, the body of the pubes, and the frontal bone immediately above the right superciliary ridge.

The appended table contains references to descriptions and accessible examples of parosteal lipomata.

PAROSTEAL LIPOMATA.

Seat.	Reporter.	Reference.
Femur	D'Arcy Power	*Trans. Path. Soc.*, xxxix. 270.
Tibia and Fibula	Butlin	*Trans. Path. Soc.*, xxviii. 221.
Ischium	T. Smith	*Trans. Path. Soc.*, xvii. 286.
Spine of Ilium	Walsham	*Trans. Path. Soc.*, xxxi. 310.
Clavicle	Gould	Museum, Middlesex Hospital.
Scapula	T. W. Nunn	Museum, Middlesex Hospital.
Neck of Radius	T. Smith	*Trans. Path. Soc.*, xix. 344.
Coccyx	T. Smith	*Trans. Path. Soc.*, xxi. 334.
Frontal	Sydney Jones	*Trans. Path. Soc.*, xxxii. 243.

* T. Smith, Trans. Path. Soc., vol. xii. 148. See also Lebert, "Traité d'Anatomie Pathologique," plate xvi., fig. 11, t. i. p. 128.

† Trans. Path. Soc., vol. xxviii. 216.

8. **Meningeal Lipomata.**—Fatty tumours occur within the spinal dura mater, as well as external to this membrane. When growing within the sheath they surround the cord. Gowers,* Recklinghausen,† and Obré‡ have recorded examples. In the cases described by the first two observers the tumours

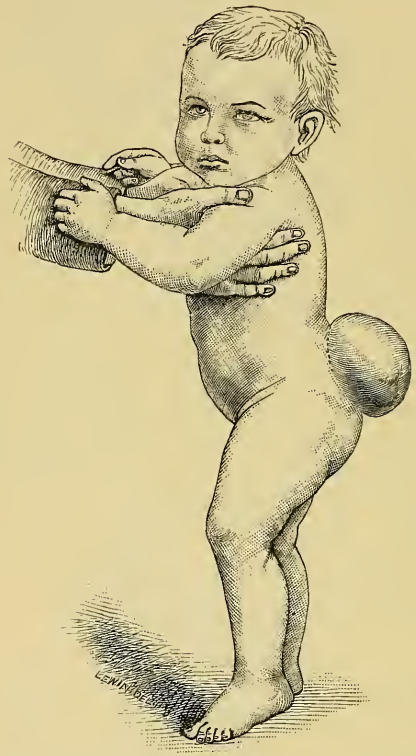

Fig. 9.—Meningeal lipoma simulating a spina bifida in a child eight months old. (*After Témoin.*§)

contained striped muscle tissue. The occurrence of an intra-dural lipoma is not surprising, as the loose connective tissue between the cord and dura mater contains fat.

Fatty tumours are not uncommon in the middle line of the

* Trans. Path. Soc., vol. xxvii. 19.
† Virchow's "Archiv," bd. cv. 243.
‡ Trans. Path. Soc., vol. iii. 248.
§ *Arch. Provinciales de Chirurgie*, 1892, p. 179.

back, especially in the lumbo-sacral region, overlying the sac of a spina bifida. (Figs. 9 and 10.)

Clinical Features.—Although lipomata occur more frequently than any other genus of connective tissue tumours, and may, in most instances, be diagnosed with absolute certainty, yet under some conditions they are very puzzling, and give rise to much difference of opinion. The subcutaneous species is rarely the source of doubtful diagnosis, unless

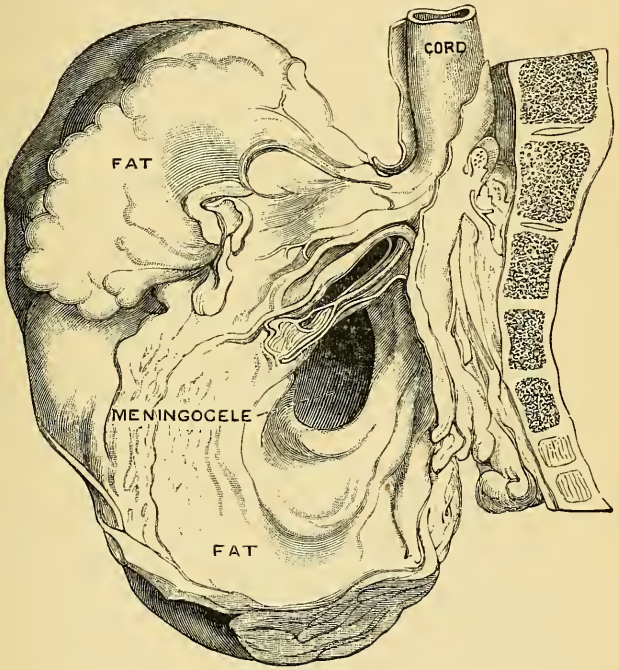

Fig. 10.—Meningeal lipoma overlying the sac of a spina bifida. (*Museum, Royal College of Surgeons.*)

situated in the palm of the hand, sole of the foot, or on the scalp. The intimate relation between the tumour and the overlying skin, the absence of definite boundaries and its dough-like consistence, are usually sufficiently trustworthy guides. When a lipoma is connected with the periosteum of a long bone it will sometimes simulate a sarcoma; when embedded in a muscle the most divergent opinions are often expressed in regard to the nature of the tumour.

Reference has already been made to those large lipomata which arise in the subperitoneal tissue and the way they mimic the signs of ovarian tumours. Lipomata in the neighbourhood of hernial openings have often been confounded with herniæ.

Especial attention must be drawn to supposed fatty tumours situated in the middle line of the back: in most cases these are abnormal masses of fat overlying the sacs of spinæ bifidæ. Incautious surgeons, in operating upon such tumours, have unexpectedly opened the dura mater.

Treatment.—Solitary subcutaneous lipomata should, as a general rule, be removed. When very many tumours are present (ten or twenty) it is not customary to interfere with them, for when multiple they rarely attain uncomfortable or dangerous proportions. It occasionally happens with multiple, (and also with solitary) lipomata, that one or other becomes irritated with some part of the dress, such as petticoat bands, braces, etc., or in some particular employment followed by the individual. Such tumours should invariably be removed.

The removal of a subcutaneous lipoma is one of the simplest proceedings in surgery, but the extirpation of a large subperitoneal fatty tumour is often attended with difficulty and grave danger.*

Diffuse lipomata do not admit of removal. It was formerly stated that liquor potassæ, taken internally, caused them to diminish in size and even disappear. So far as my observations have extended, the administration of this drug is useless in preventing the growth or reducing the size of these tumours.

* Homans, *International J. Med. Sci.*, April, 1891; and Spencer Wells, "Ovarian and Uterine Tumours," 1882.

CHAPTER II.

CHONDROMATA (CARTILAGE TUMOURS).

Chondromata (enchondromata) are tumours composed of hyaline cartilage. This genus contains three species:—1, chondromata; 2, ecchondroses; 3, loose cartilages in joints.

1. **Chondromata.**—Cartilage tumours in their typical condition occur in long bones, and, as a rule, grow in relation with the epiphysial cartilages, hence they are most frequently observed in children and young adults. Often a chondroma is solitary, but very frequently many exist, especially on the long bones of the hand. A remarkable case is depicted in Fig. 11; this patient was under observation at the Tubingen Clinic twenty-five years. He died at the age of forty-five. Most of the long bones of the limbs were occupied with cartilage tumours. Some of them were very large.* Kast and Recklinghausen† have described a similar case, and I have a photograph of a lad who used to be exhibited for gain at fairs in various parts of England, with cartilage tumours on his hands, feet, and legs as numerous as in Steudel's unfortunate patient.

Chondromata are always encapsuled, and form deep hollows in the bones from which they grow; they are painless, grow slowly, and are firm to the touch. Frequently they undergo mucoid softening, then the softened patches give rise to fluctuation. This often serves to distinguish them from osteomata, with which they are liable to be confounded clinically. Cartilage tumours are prone to ossify.

The frequency of chondromata in those who were rickety in early life may be due, as Virchow pointed out, to the existence of untransformed pieces of cartilages acting the part of tumour-germs. Such remnants of unossified cartilage (cartilage islands) are not difficult of demonstration in rickety bones. (Fig. 12.)

It is a curious circumstance that the tissue of a chondroma

* Bruns, *Beiträge*, bd. viii. 503.

† Virchow's "Archiv," bd. cxviii. s. i.

resembles, histologically, the bluish translucent epiphysial cartilage characteristic of progressive rickets.

2. **Ecchondroses** may be defined as small local overgrowths of cartilages. They are best studied in three situations—viz.,

Fig. 11.—Lad twenty years of age with multiple chondromata. (*After Steudel.*)

along the edges of articular cartilages, the laryngeal cartilages, and the triangular cartilage of the nose.

Ecchondroses of articular cartilage are especially common in the knee joint, and occur in connection with the condition known as rheumatoid arthritis. They are frequent in the joints of persons past the meridian of life, and they present

themselves as small projecting prominences along the margins of the articular cartilage. Often the edge of the cartilage is produced into a raised prominent lip, the regularity of which is broken here and there by a sessile or pedunculated nodule.

When these nodules are examined many of them present on their outer surface a convex outline, but on the inner aspect—that looking towards the joint—they are concave, the concavity being produced by friction during the movements of the joint, or by pressure when the parts are at rest. Occasionally erosion of the ecchondrosis may extend so deeply that by some extra movement of the joint the pedicle is broken, and the detached nodule either falls as a loose body into the

Fig. 12.—Condyles and epiphysial line of a rickety femur, with a cartilage island.

joint-cavity, or it may be retained in position by its attachments to the fibrous structures of the articulation.

Laryngeal ecchondroses are by no means common; they grow from the thyroid, cricoid, and occasionally the arytenoid cartilages. Paul Bruns* collected fourteen cases of laryngeal chondromata; of these, eight sprang from the cricoid, four from the thyroid, one from the arytenoid, and one from the epiglottis. Most of the ecchondroses of the cricoid cartilage sprang from the broad posterior plate. In many of the cases the inner and outer surfaces of the cricoid were involved, so that the tumour encroached upon the cavity of the larynx. Ecchondroses vary greatly in size; some are scarcely larger than a pea, others may be as big as walnuts. Morell

* *Beiträge zu Klin.-Chir.*, bd. iii. 347.

Mackenzie* has described an example growing from the cricoid which attained the size of a bantam's egg; in this instance the tumour extended downwards in front of the trachea. Small ecchondroses growing from the inner surfaces of the laryngeal cartilages are more dangerous than the larger examples springing from their outer surfaces. Ecchondroses, when projecting into the larynx, are covered with its mucous membrane; they may be smooth or tuberculated, round or conical. In exceptional cases the overlying mucous membrane has been found ulcerated. Chondromata, when they project into the larynx, produce stridor, difficulty in breathing, and sometimes interfere with the movements of the vocal cords. When the tumours only involve the outer surfaces of the laryngeal cartilages, they do not as a rule produce any inconvenience unless they are exceptionally large.

Small outgrowths from the triangular cartilage of the nose are by no means uncommon; they never attain a large size, and are always sessile. It is difficult to imagine that ecchondroses of the nasal cartilage could be a source of much inconvenience, but some surgeons, who are enthusiastic in treating diseases of the nasal passages, view them with disfavour.

3. **Loose Cartilages.**—Bodies of various kinds are found loose in the cavities of large joints, but those to be considered under the head of chondromata, in addition to detached ecchondroses, are pieces of hyaline cartilage found hanging in the joint by narrow pedicles, or occupying depressions in the bone, from which they are occasionally dislodged. Structurally they are composed of hyaline cartilage, and assume various forms. Some appear as flat discs, others are ovoid; they may be perfectly smooth, or present an irregular worm-eaten appearance, and the majority are impregnated with calcareous particles. It is a remarkable fact that in many instances in which a loose cartilage has been found in one joint, a body identical in size and shape has been found in the corresponding joint of the opposite limb.† Loose cartilages may be single or

* Trans. Path. Soc., vol. xxi. 58.

† Bowlby, Trans. Path. Soc., vol. xxxix. 281; Clutton, *ibid.*, vol. xxxix. 284; *American Journal of Med. Sci.*, vol. i. 303; Weichselbaum, Virchow's "Archiv," lvii. 127.

multiple: several hundred may exist in one joint, and vary in size from a rape-seed to an almond.

The origin of these cartilages is interesting. In large joints, such as the hip, knee, or shoulder, it is easy to demonstrate, in the recesses of the joint near the spot where the synovial membrane becomes continuous with the margin of the articular cartilage, villous-like processes of the synovial membrane projecting into the joint. Under certain conditions, especially that known as rheumatoid arthritis, these villi become greatly enlarged and increase in number until the whole synovial membrane may be so covered with them as to become quite velvety in appearance. Structurally, these synovial villi consist of a reduplication of the serous membrane, and contain tufts of capillaries. As they enlarge, some of them undergo chondrification, and this change may take place so extensively that a villous process is entirely converted into hyaline cartilage, which becomes the matrix for a deposit of lime salts. As these nodules of cartilage are merely sustained by narrow pedicles, the nodules may be detached either by their mere weight, undue movement of the joint, or from axial rotation, and tumbling into the joint give rise to all the inconveniences characteristic of a loose body. Specimens occasionally come to hand in which cartilaginous bodies of this description may be found sessile among the fringes, or hanging on good pedicles, or with stalks so thin that they appear to be on the eve of detachment.

Occasionally these overgrown synovial villi, instead of chondrifying, are converted into oval bodies, which, on microscopic examination, present a central cavity surrounded by a laminated structureless substance. To the naked eye many of these oval bodies resemble cartilage, and it is only on microscopical examination that it is possible to distinguish between them; many are infiltrated with calcareous granules. These oval bodies are present in some cases in great number. On one occasion Mr. Bentlif sent me 1,532 which he removed from the shoulder joint of a girl. Loose bodies of this character occur not only in joints, but in compound ganglia and in bursæ.

In concluding this account of cartilage tumours it is very necessary to point out that every tumour containing cartilage

is not necessarily a chondroma. In describing sarcomata it will be pointed out that the spindle-celled species is very apt to contain cartilage, particularly when arising in the testis, parotid gland, or periosteum. Much ingenious speculation has been exercised to account for the presence of cartilage in sarcomata arising in such structures, but it appears to be an extremely easy task for connective tissue to form hyaline cartilage.

Treatment.—The operative treatment of chondromata has been greatly simplified since surgeons have appreciated the fact that these tumours, when growing in relation with bones, are distinctly encapsuled. Hence, when it is necessary to interfere with a chondroma, even in cases where several tumours are present, it has become customary to incise the capsule and shell out the cartilage. In most instances this simple method is successful. Exceptionally, however, cases come under observation which demand more serious measures. When the cartilage tumours are very numerous on the bones of the hand, the fingers are so crippled and useless that amputation becomes necessary. In the patient represented in Fig. 11 the weight of the tumours caused so much fatigue that it was deemed advisable to amputate the hand. Fortunately, such severe treatment is very rarely needed.

In the case of loose bodies in joints it is the usual practice, when the pieces of cartilage are in the habit of getting between the opposed surfaces of the joints, to open the synovial cavity, and remove the loose body or bodies. When this manœuvre is conducted with proper care it is highly successful. When the loose body is lodged in a sacculus, it is in a measure isolated from the general cavity of the joint, and does not call for interference. The smaller bodies, which, like mice, slip in and out of the recesses of a complex joint, are more likely to give trouble than those larger pieces of cartilage, sometimes as big as chestnuts, which the patients can grasp with their fingers, and slip in and out of the great cul-de-sac above the patella almost as readily as a marble may be manipulated under a tablecloth. Bodies of this sort rarely call for interference.

CHAPTER III.

OSTEOMATA (OSSEOUS TUMOURS).

It has been customary to describe almost all kinds of tumours composed of bone, or bone-like tissue, under the name of exostoses. A critical examination of these tumours indicates that they belong to at least two genera, osteomata and odontomata. The term exostosis should be limited to irregular bony outgrowths to which the term tumour is not in any sense applicable.

Osteomata may be defined as ossifying chondromata, for they are found near the epiphysial lines of long bones, and when they arise in connection with flat bones it is generally in the vicinity of a tract of cartilage. Every growing osteoma has a cap of hyaline cartilage, which stands in the same relation to the growth of the tumour as an epiphysial line to the increase in length of a long bone.

The genus osteoma contains two species :—1, the compact or ivory osteoma ; 2, the cancellous osteoma.

1. **Compact Osteomata.**—These are structurally identical with the tissue forming the shaft of a long bone. They may occur on any part of the skeleton, but are more frequent in the frontal sinus, external auditory meatus, and mastoid process than elsewhere.

The general characters of an osteoma of the frontal sinus may be gathered from the specimen (Figs. 13 and 14) preserved in the museum of the Royal College of Surgeons, London ; it is figured in Baillie's "Morbid Anatomy," fas. x., pl. i., fig. 2. Unfortunately, no history of the case is forthcoming. Many of these tumours extend into the orbit, and others sometimes make their way through the posterior part of the orbital roof into the cranial cavity.

Osteomata of this kind arise occasionally in the frontal sinuses of oxen, and form huge irregular lobulated masses, sometimes weighing as much as sixteen pounds, and as dense as ivory. Similar tumours grow from the petrosal and encroach upon the cranial cavity; some of these have been reported in veterinary literature as ossified brains !

In many instances very large tumours have been removed from the maxillæ and described as exostoses; some of these were huge odontomes. (*See next Chap.*)

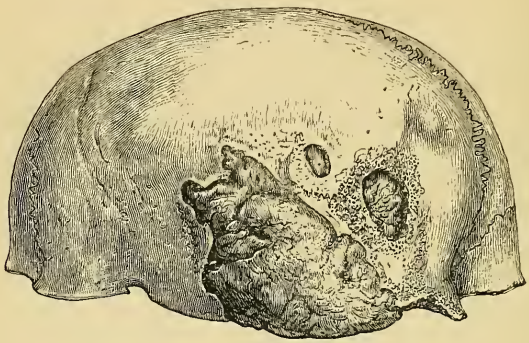

Fig. 13.—Osteoma of the left frontal sinus (anterior view).

Osteomata at the margins of the external auditory meatus have been especially studied because they are apt to obstruct

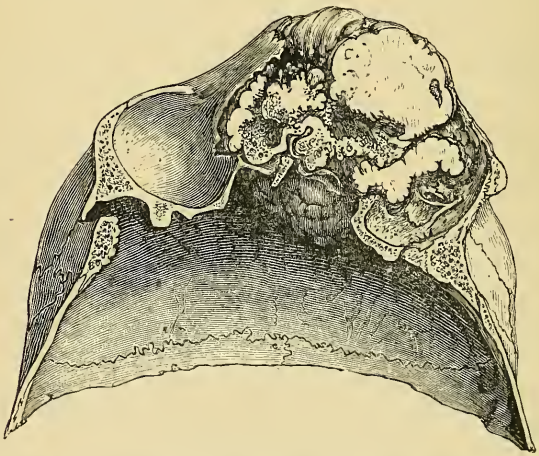

Fig. 14.—Osteoma of the left frontal sinus, seen from below. (*Museum, Royal College of Surgeons.*)

the meatus and cause deafness; when both meatuses are affected—and this is not rare—absolute deafness may result. It is a curious fact that osteomata at the margins of the auditory meatus have been observed in many different races of men.

Professor Sir William Turner* has drawn attention to observations of Seligmann, Welcker, Barnard Davis, and added some of his own, concerning the presence of such exostoses in certain deformed skulls described as Titicaca's, Huanaka's, and Aymara's. Also in skulls from the Marquesas Islands, Sandwich Islands, Chatham Island, and New Zealand.† It is not surprising that osteomata should arise from the walls of the external auditory meatus when we remember the number of centres by which the periotic cartilage is transformed into bone, and the various ossific elements that come into relation with each other at this meatus.

2. **Cancellous Osteomata.**—These tumours in structure resemble the cancellous tissue of bone, and are soft in comparison with the preceding species. They usually possess a thick covering of hyaline cartilage, and when growing at the distal end of the radius, or tibia, present a series of deep channels for the passage of tendons. Occasionally an osteoma is pedunculated; more frequently it has a broad base. Osteomata, whether sessile or stalked, usually grow slowly, but in the course of years they sometimes attain large proportions. They are innocent tumours, but occasionally imperil life by mechanically interfering with the function of vital organs. Reid‡ described a case in which an osteoma grew from the posterior surface of the odontoid process and projected into the neural canal to the extent of 8 mm. and compressed the spinal cord with fatal effect. Although in themselves painless, osteomata often induce pain by pressing on nerve trunks in their vicinity.

Exostoses.—The various bony outgrowths classed as exostoses fall into three groups :—

1. Ossification of tendons at their attachments.
2. The sub-ungual exostosis.
3. Calcification of inflammatory exudations.

1. *Exostoses formed by Ossification of Tendons at their Attachments.*

The long bones of a child at birth are smooth in outline and almost cylindrical in shape; the periosteum is relatively

* *Journal of Anat. and Physiology*, vol. xiii., p. 200.

† Zoology of the "*Challenger* Expedition," pt. xxix., p. 117.

‡ *Edin. Med. Journal*, 1843, p. 194.

thick, and gives attachment to the muscles. On examining the long bones of an adult muscular man their shafts are found to be irregular, and present many asperities, such as the linea aspera, gluteal ridges, oblique lines, and the like. These ridges and lines, in the majority of instances, are the ossified insertions of muscles, and occasionally they are so pronounced as to be appreciable through the soft structures, and are then described clinically as exostoses. The two most frequent

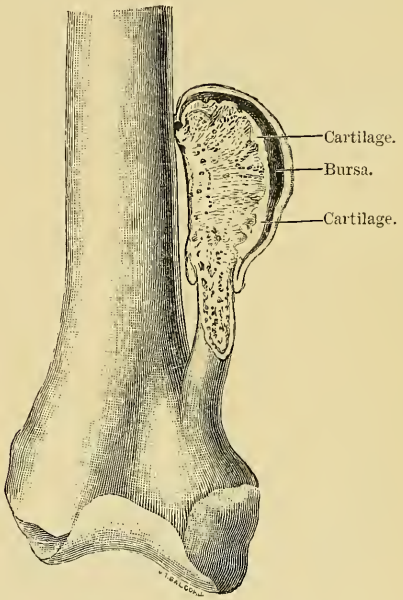

Fig. 15.—Exostosis of the femur: its surface was clad with cartilage and surmounted by a bursa. (*After Orlow.**)

examples of this form of exostosis are the adductor tubercle of the femur and the tubercle on the first rib at the insertion of the scalenus anticus. Probably the most common exostosis is that which occurs in the tendon of insertion of the adductor magnus: it usually assumes the form of a broad ledge of bone; exceptionally it is stalked, and in rare cases surmounted by a bursa (Fig. 15); the walls of such bursæ are now and then furnished with villi, and even loose bodies have been found in them. Care must be taken not to confound a supracondyloid

* *Zeitschrift für Chir.*, bd. xxxi. 293.

process of the humerus, and the occasional third trochanter of the femur, with exostoses.

A bursa will form on exostoses or osteomata if their surfaces be exposed to pressure, or to friction from the movement of tendons and muscles.

Localised outgrowths are very common on the facial bones, especially the nasal processes of the maxillæ, where they may be unilateral or bilateral. (Fig. 16.) The cause of these exostoses is obscure. Small irregular osseous prominences are fairly frequent along the alveolar borders of the maxillæ and mandible.

Fig. 16.—Symmetrical exostoses of the nasal processes of the maxillæ. (*After Hutchinson.**)

Exostoses of the maxillæ similar to those in Fig. 16 have been observed in natives of the West Coast of Africa. Interesting particulars relating to these cases are furnished by Macalister,† and more recently by Lamprey,‡ of the Army Medical Staff. Macalister discusses the condition in relation to the supposed existence of horned men in Africa.

2. *The Sub-ungual Exostosis* is a troublesome outgrowth from the ungual phalanx of the big toe; it makes its way through the bed of the nail, and peers out between the nail and the skin at the tip of the toe, nearer the inner than the outer side;

* "Illustrations of Clin. Surgery," vol. i., p. 2.

† Proc. R. Irish Academy, 2nd Series, vol. iii., 1882.

‡ *Brit. Med. Journal*, 1887, vol. ii., 1273.

its appearance is so characteristic that it only requires to be once seen to be appreciated readily. (Fig. 17.)

The sub-ungual exostosis is never very large : as a rule, it is no bigger than a cherry-stone ; exceptionally it may be double this size, but larger examples are excessively rare. The soft tissue overlying the exostosis is apt to ulcerate. As seen projecting beneath the nail it is of a dull red colour. When the soft tissues investing it are removed, the tumour appears as a low prominence of cancellous bone jutting from the dorsal surface of the terminal phalanx. These outgrowths are probably due to the pressure of ill-fitting boots, and should be ranked among inflammatory productions.

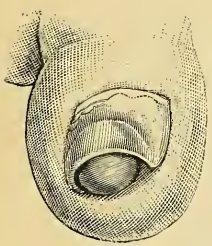

Fig. 17.—Big toe with a sub-ungual exostosis.

3. Exostoses due to *calcification of inflammatory exudations* scarcely require consideration in this work : there is reason to believe that some of the cases described as multiple exostoses were really examples of the strange and rare disease known as "myositis ossificans."

Bony tumours are of fairly frequent occurrence in all vertebrata. Paul Gervais* has published descriptions of many interesting specimens from fish. Perhaps the most striking example is furnished by the skeleton of the fish *Chætodon*, in which some of the bones are furnished with rounded bony tumours. The museum of the Royal College of Surgeons contains many loose bones with tumours, as well as the skeleton of the original fish sent by William Bell† to John Hunter. (Fig. 18.) Single bones of *Chætodon* are not uncommon in osteological collections ; Cuvier explained this by stating that they are brought home by travellers who have eaten this fish. On section it will be found that the outline of the ray can be clearly defined running through the midst of the tumour. For fuller details relating to *Chætodon*, consult the subjoined reference.‡

Treatment.—When osseous tumours grow in situations

* *Journal de Zoologie*, 1875, vol. iv.

† Phil. Trans., 1793.

‡ Trans. Path. Soc., vol. xxxix. 472.

where they do not involve important structures, the rule is not to interfere with them. When they press upon nerves and occupy

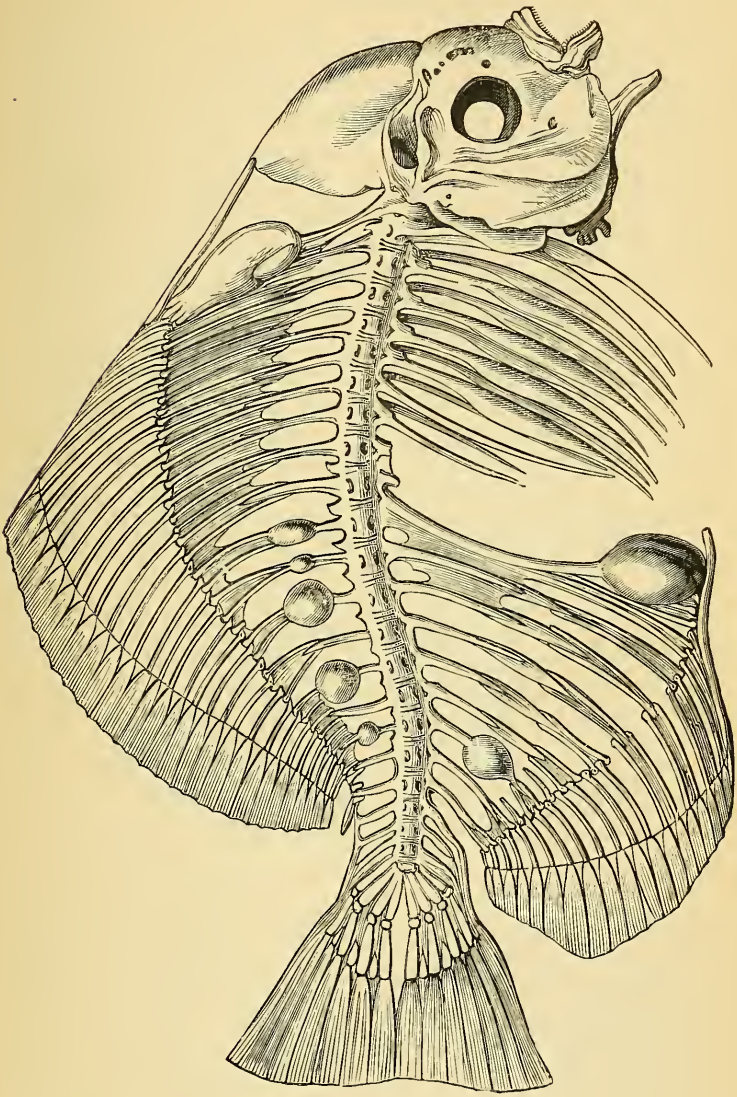

Fig. 18.—Bell's specimen of *Chelodon*, with its bony tumours and large occipital crest.

accessible situations, and especially when pedunculated, they may be removed with chisel and mallet, or with stout forceps.

Cranial osteomata are as a rule formidable objects; when growing from the roof of an orbit, or frontal bone, they not infrequently extend as deeply into the cranial cavity as they project beyond it.*

Osteomata obstructing the external auditory meatus, and producing deafness, have been on many occasions successfully perforated by means of steel drills.

Osseous tumours, especially when sessile and of the ivory variety, sometimes require the most persevering efforts of the surgeon, aided by the best surgical cutlery. When exostoses are seated near joints and the synovial membrane is likely to be opened in the operation, they should not be removed unless they produce grave interference. It should always be remembered that in removing osteomata and exostoses, the cancellous tissue of the bone from which they grow is opened. Sub-ungual exostoses are best treated by removing the nail, then exposing the base of the bony projection and detaching it from the phalanx with cutting forceps.

* Spencer Watson reported a case on which Fergusson operated which illustrates this fact. Trans. Path. Soc., vol. xix. 310.

CHAPTER IV.

ODONTOMATA (TOOTH TUMOURS).

An **Odontome** is a tumour composed of dental tissues in varying proportions and different degrees of development, arising from teeth-germs, or teeth still in the process of growth.

The species of this genus are determined according to the part of the tooth-germ concerned in their formation.

1. Epithelial odontome : from the enamel-organ.
2. Follicular odontome
3. Fibrous odontome
4. Cementome
5. Compound follicular odontome

} From the tooth-follicle.

6. Radicular odontome : from the papilla.
7. Composite odontome : from the whole germ.

1. **Epithelial Odontomes.**—These tumours occur, as a rule, in the mandible, but they have been observed in the maxilla.

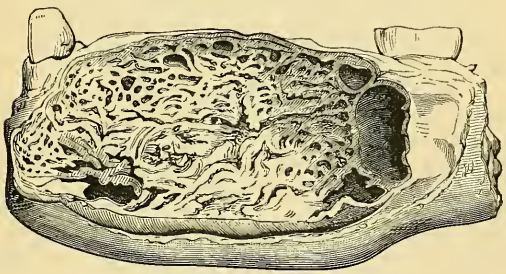

Fig. 19.—Epithelial odontome. (*Nat. size.*)

They have a fairly firm capsule, and in section display a congeries of cysts of various shapes and sizes; but the loculi rarely exceed 2 cm. in diameter. The cysts are separated by thin fibrous septa, sometimes ossified. The cavities contain mucoid fluid of a brownish colour. The growing portions of the tumour have a reddish tint not unlike a myeloid sarcoma (Fig. 19).

Histologically, an epithelial odontome consists of branching and anastomosing columns of epithelium, portions of which

form alveoli. (Fig. 20.) The cells occupying the alveoli vary: the outer layer may be columnar, whilst the central cells degenerate and give rise to tissue resembling the stratum intermedium of an enamel-organ.

Odontomes of this species are most frequent about the twentieth year, but they may occur at any age.

The tumours have been investigated by Eve (who gave them the name of multilocular cystic epithelial tumour) and by Falkson and Bryck. They probably arise from persistent portions of the epithelium of enamel-organs.

2. **Follicular Odontomes.**—This species comprises those

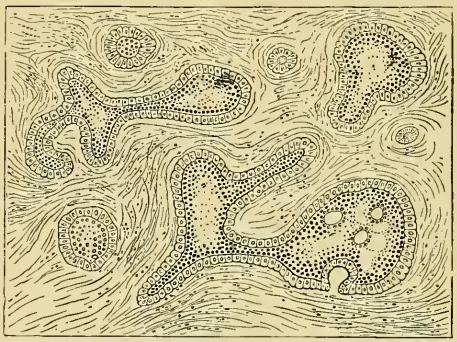

Fig. 20.—Microscopical characters of an epithelial odontome.

swellings often called dentigerous cysts, a term which has come to be used very loosely. Follicular odontomes arise commonly in connection with teeth of the permanent set, and especially with the molars. Sometimes these tumours attain large dimensions, and produce great deformity. The tumour consists of a wall of a varying thickness, which represents an expanded tooth-follicle; in some cases it is thin and crepitant, in others it may be 1 cm. thick. The cavity of the cyst usually contains viscid fluid and the crown or the root of an imperfectly developed tooth; occasionally the tooth is loose in the follicle, sometimes inverted, and often its root is truncated (Fig. 21); exceptionally the tooth is absent. The walls of the cyst always contain calcific or osseous matter; the amount varies considerably. Follicular odontomes rarely suppurate.

These tumours are not unknown in other mammals; I

have seen them in lambs, pigs, and porcupines. C. Tomes has suggested that these cysts are probably due to the excessive formation around a retained tooth, between it and the wall of the follicle, of a fluid which is normally present after the complete development of a tooth.

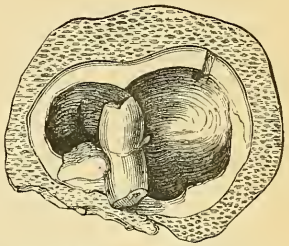

Fig. 21.—Follicular odontome (dentigerous cyst). The tooth has a truncated root. (*Nat. size.*)

3. **Fibrous Odontomes.**—In a developing tooth, a portion of the connective tissue in which it is embedded, is found to be denser and more vascular than the rest; it also presents a fibrillar arrangement. This condensed tissue is known as the tooth-sac, and when fully developed presents an outer firm wall and an inner looser layer of tissue. At the root of the tooth the follicle-wall blends with the dentine papilla, and is indistinguishable from it Before the tooth cuts the gum it is completely enclosed within this capsule. Under certain

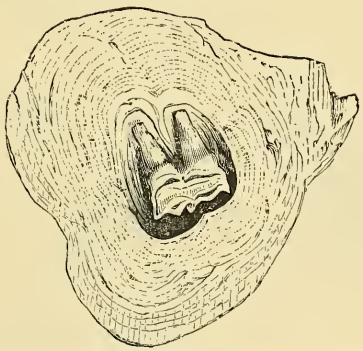

Fig. 22.—Fibrous odontome from a goat. (*Nat. size.*)

conditions this capsule becomes greatly increased in thickness, and so thoroughly encysts the tooth that it is never erupted (Fig. 22). Such thickened capsules are mistaken for fibrous tumours, especially if the tooth be small and ill-developed. Under the microscope they present a laminated appearance, with strata of calcareous matter. To these, the term fibrous odontomes may be applied. They are more common in ruminants than in other mammals, and are especially frequent

in goats. As a rule they are multiple, four being by no means an unusual number. They occur in marsupials, bears, and lions, as well as in the human subject.

There is good reason for the belief that rickets is responsible for some of these thickened capsules. That the tooth-sac should thicken in rickety children need not surprise us when we remember that this remarkable disease affects most particularly those membranes engaged in the production of bone. Such thickenings of the follicles occur in rickety children, as the following description of a specimen, preserved in the museum of the Royal College of Surgeons, testifies. It runs thus in the catalogue: "Sections of two myeloid tumours developed symmetrically in the angles of the lower jaw. Their surfaces are covered by the external layer of compact tissue of the bone which they have expanded and thinned."

These tumours were removed by Mr. Heath from a boy seven and a half years old, with rickety legs, but he was well nourished when the tumours were removed; they were

Fig. 23.—Cementome from a horse. (*Half nat. size.*)

observed when he was two and a half years old. After a careful examination of these tumours I have no hesitation in declaring them to be thickened tooth-follicles — fibrous odontomes.

4. **Cementomes.**—When the capsule of a tooth becomes enlarged, as in the specimens just considered, and these

thick capsules ossify, the tooth will become embedded in a mass of cementum. To this form of odontome the name cementoma may be applied. Odontomes of this character occur most frequently in horses, and sometimes attain a large size. Broca* has described and figured specimens from horses. Mr. Charles Tomes † has described one which weighed ten

Fig. 24.—Compound follicular odontome from a Thar (*Capra jemlaica*). N, Superior maxillary division of the fifth nerve. (*Nat. size.*)

ounces, and I have given an account of another which weighed twenty-five ounces. The main portion of this odontome is sketched in Fig. 23. When divided, three teeth could be made out, embedded in cementum. The periphery of the tumour was cautiously decalcified in hydrochloric acid, and sections were prepared for the microscope. The structure of the decalcified mass was very instructive, for the periphery of the tumour exhibited the laminated disposition seen in fibrous odontomes.

The largest cementome from a horse known to me is preserved in the museum of the Royal Veterinary College, London; it weighs seventy ounces, and though excessively dense, is nevertheless very vascular. Its chief structural

* "Traité des Tumeurs," t. ii., p. 350, 1869.

† Trans. Odont. Soc. Great Britain, 1872, p. 103.

peculiarity is the presence, in enormous numbers, of large, richly branched lacunæ.*

5. **Compound Follicular Odontomes.**—If the thickened capsule ossifies sporadically instead of *en masse* a curious condition is brought about, for the tumour will then contain a number of small teeth or denticles consisting of cementum, or dentine, or even ill-shaped teeth composed of three dental elements, cementum, dentine, and enamel. The number of teeth and denticles in such tumours varies greatly, and may reach a total of three or four hundred. The odontome sketched in Fig. 24 was of this nature. I obtained it from a Thar or Himalayan goat, which had one in each upper jaw. The interior of each tumour was occupied with teeth, denticles, and fragments of cementum of varying size, numbering in all three hundred. This odontome is preserved in the museum of the Royal College of Surgeons. The shape and size of the

Fig. 25.—Denticles from the odontome of a Thar. (*Nat. size.*)

denticles may be inferred from those sketched in Fig. 25. These fragments were firmly embedded in the fibrous walls of the tumour, whilst those which were free in the sac had become loosened by suppuration.

Tumours of this character have been described in the human subject by several observers. Amongst the most noteworthy are the following:—

Tellander, of Stockholm, met with a case in a woman aged twenty-seven years. The right upper first molar, bicuspids, and canine of the permanent set had not erupted, but the spot where these teeth should have been was occupied by a hard, painless enlargement, which the patient had noticed since the age of twelve years. Subsequently this swelling was found to

* Trans. Odont. Soc. Great Britain, 1891, p. 215.

contain minute teeth. There were nine single teeth, each one perfect in itself, having a conical root with a conical crown—tipped with enamel; also six masses built up of adherent single teeth. The denticles presented the usual characters of supernumerary teeth. About a year afterwards a tooth was found making its appearance in the spot from which the host of

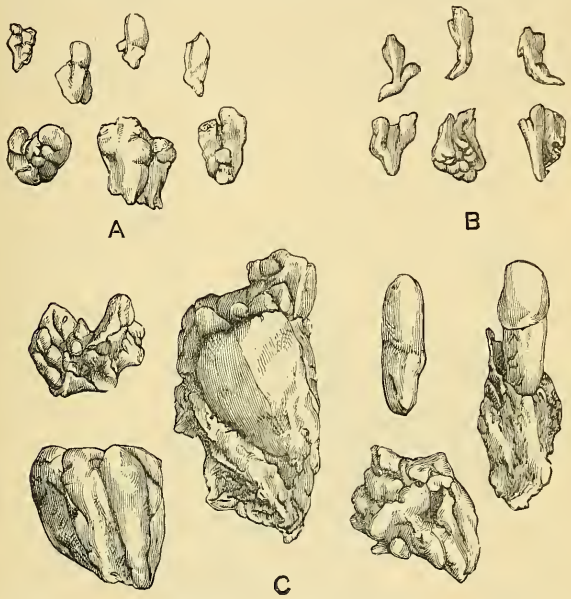

Fig. 26.—A, Denticles from Tellander's case. Total number, twenty-eight.
B, ,, from Sims's case. Total number, forty.
C, ,, from Mathias's case. Total number, fifteen.

teeth was removed. A few of the teeth are represented in Fig. 26.

A similar case has been recorded by Sir John Tomes, the details of which were communicated to him by Mr. Mathias,* whilst on medical service in India. A Hindoo, aged twenty, had a large number of ill-formed teeth united. Further search was instituted, until at last fifteen masses of supernumerary teeth and bone were removed. The soft parts rapidly healed, the deformity disappeared, and the only peculiarity noticeable was the absence of the central and lateral incisors. The canines

* Trans. Odont. Soc. Great Britain, vol. iii., p. 365.

occupied their usual position. A few of the fragments are shown in Fig. 26, C.

A third example of this remarkable condition has been recorded by Professor Windle and Mr. Humphreys.* The case occurred in the practice of Mr. Sims at the Dental Hospital, Birmingham. The tumour was found in the mouth of a boy aged ten years; neither the deciduous nor permanent right lateral incisor or canine had erupted. The space thus unoccupied was filled by a tumour with dense unyielding walls. On

Fig. 27.—Radicular odontome from human subject. A represents the natural size of the specimen. (*After Salter.*)

opening this tumour forty small denticles of curious and irregular forms were removed (Fig. 26, B).

Albert † and Hildebrand ‡ have observed similar cases, and Logan § reported an example from the maxilla of a horse containing four hundred denticles.

6. **Radicular Odontomes.**—This term is applied to odon-

* *Journal of Anat. and Physiology*, vol. xxi., 1887.

† *Illustrated Med. Journal*, Aug. 10, 1889.

‡ "Zeitsch. für Chir.," bd. xxxi. 282.

§ *Journal of Comp. Med. and Surgery*, New York, 1887.

tomes which arise after the crown of the tooth has been completed, and while the roots are in the process of formation. As the crown of the tooth, when once formed, is unalterable, it naturally follows that should the root develop an odontome enamel cannot enter into its composition; the tumour would consist of dentine and cementum in varying proportions, these two tissues being the result of the activity of the papilla.

As a typical radicular odontome, we may choose the well-known specimen described by Salter, and represented in Fig. 27. In this specimen the tumour is clearly connected with the roots. The outer layer of the odontome is composed of cementum; within this is a layer of dentine, deficient in the lower part of the tumour, and inside this is a nucleus of calcified pulp.

Mr. Hare, of Limerick, removed from the upper jaw of a man aged forty-one the odontome sketched in Fig. 28. This specimen was originally described by Sir John Tomes,* but it was examined and redescribed by Mr. Charles Tomes.† The mass is invested by cementum; inside this casing is a shell of dentine; the tubules radiate outwards and are disposed with some regularity: this dentine was deficient at the distal end of the tumour; its interior was filled with an ill-defined osseous material.

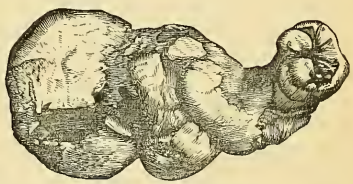

Fig. 28.—Radicular odontome. (*Nat. size.*) (*After John Tomes.*)

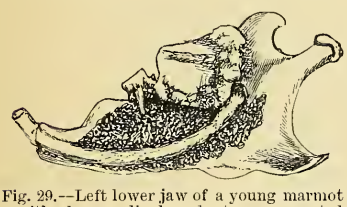

Fig. 29.—Left lower jaw of a young marmot with a large radicular odontome connected with the incisor. (*Nat. size.*)

Radicular odontomes are rare in man, but frequent in other mammals, and are often multiple. Rodents are especially liable to them, due in a large measure to the fact that their teeth grow from persistent pulps. A young marmot had four odontomes, one attached to each incisor in the upper and lower jaw. One of them is sketched *in situ* (Fig. 29)

* Trans. Odont. Soc. Great Britain, 1863.

† Trans. Odont. Soc. Great Britain, 1872.

and of natural size. It consisted mainly of cementum. A similar tumour from a Canadian porcupine is shown in Fig. 30. It consisted mainly of dentine. The tumour was lodged in a

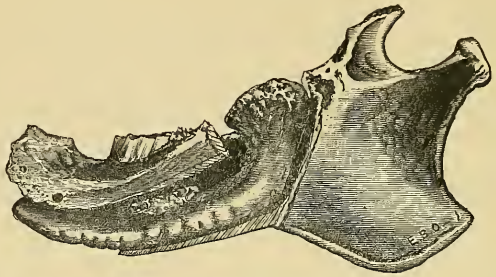

Fig. 30.—Lower jaw of an adult Canadian porcupine. A radicular odontome is attached to its lower incisor. (*Nat. size.*)

large pus-containing cavity, and the surrounding bone was bare and dead. I have recorded a similar specimen in an agouti. In all these cases death was probably due to the profuse suppuration set up by the odontomes, the pus, being drawn into the air-passages, setting up septic pneumonia.

Radicular odontomes have been obtained from elephants, arising in connection with the roots of the tusks ; indeed, the largest odontomes on record were obtained from elephants. The museum of the Royal College of Surgeons contains several excellent specimens. Structurally they consist almost entirely of osteo-dentine. A radicular odontome described by Windle

Fig. 31.—Two drawings of a radicular cementome, from a man aged twenty-five years. (*Nat. size.*)

and Humphreys is represented in Fig. 31. It was obtained from a man twenty-five years of age.

This odontome was situated in the lower jaw, on the right side, in the neighbourhood of the second molar tooth. After more than four months' excruciating pain, accompanied with profuse suppuration, life being several times despaired of, the odontome, seven months after its presence was first noticed,

became liberated and fell into the mouth. The crown is fairly well formed, the labial surface being perfect, the lingual somewhat tuberculated. The roots are fused into a shapeless mass. The under surface is irregular, and at one point presents an excavation. It is much to be regretted that it was impossible to obtain sections of this interesting tumour.

7. **Composite Odontomes.**—This is a convenient term to apply to those hard tooth tumours which bear little or no resemblance in shape to teeth, but occur in the jaws, and consist of a disordered conglomeration of enamel, dentine, and cementum. Such odontomes may be considered as arising from an abnormal growth of all the elements of a tooth-germ—enamel-organ, papilla, and follicle.

Not only is this class of odontomes composite in that the tumours comprised in it originate from all the elements of a tooth-germ, but they are composite in another sense. In the majority of cases the tumours are composed of two or more tooth-germs indiscriminately fused. But they differ from the cementomata containing two or more teeth, in the fact that the various parts of the teeth composing the mass are indistinguishably mixed, whereas the individual teeth implicated in a cementoma can be clearly defined.

Up to the present time I have found no such odontomes in the lower mammals, all the recorded cases having occurred in man. A typical odontome of this group is the one described by Mr. Heath* as occurring in the lower jaw of a young lady,

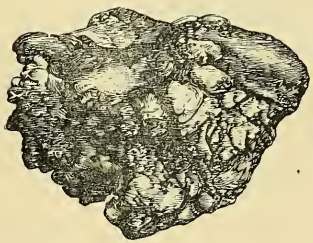

Fig. 32.—Composite odontome from a young lady aged eighteen. (*Nat. size.*) (*After Heath.*)

aged eighteen. The clinical history in this case is very instructive, and the reader is referred to the original account of it. (Fig. 32.)

* Clinical Society's Transactions, vol. xv. 10.

The specimen is further valuable on account of the exhaustive and careful histological examination made by Mr. Charles Tomes, who found it composed of enamel, dentine, and osteo-dentine.

Forget's classical case belongs to this species. The patient was twenty years old, but the disease had been noticed since the age of five years. Behind the first bicuspid no teeth were seen, but the jaw as far back as the ramus was the seat of a smooth, unyielding tumour. The parts represented in the figure were removed during life. (Fig. 33.) On microscopical examination the tumour consisted mainly of dentine, the surface of which was in places covered with enamel

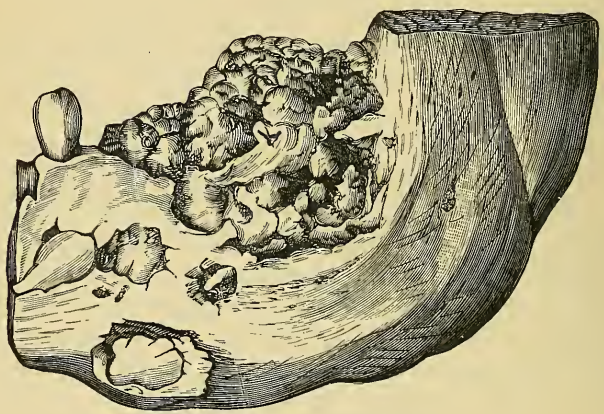

Fig. 33.—Composite odontome. (*Nat. size.*) (*After Forget.*)

dipping into the crevices, at the bottom of which cementum was found.

The Transactions of the Pathological Society, London, though a mine of wealth in most kinds of tumours, contain only one description of an odontome; it is described by Mr. Rushton Parker.* The specimen originated in connection with the second left lower molar of a lady aged nineteen years. An effort was made to extract the tooth, but it broke, leaving the tumour behind. Subsequently an attempt made to extract the mass failed, a few fragments only being detached; about two years later it issued spontaneously from

* Trans. Path. Soc., vol. xxxii. 240.

the alveolus. The odontome, which weighs 136 grains, is represented in Fig. 34, taken from a drawing kindly furnished me by Mr. Rushton Parker.

Fig. 34.—Odontome. (*Nat. size.*) (*Mr. Rushton Parker's case.*)

In the same category may be placed the odontome dislodged by Professor Annandale* from the lower jaw of a girl aged seventeen. It weighed 300 grains, and consisted of dentine and osteo-dentine capped by enamel.

Nine months before the patient was seen by Mr. Annandale, an abscess formed over the top of the swelling, from which the odontome was ultimately dislodged; the abscess left a chronic sinus from which small quantities of pus issued up to the time of the operation. No molar teeth were erupted in the right lower jaw, their position being occupied by the odontome. The cavity left by the

Fig. 35.—Odontome from the upper jaw. (*Nat. size.*) (*M. Michon's case.*)

dislodgment of the tumour was lined with a smooth, velvety membrane.

It is supposed that odontomes are more frequent in the lower than the upper jaw, but there is good ground for the

* *Edin. Med. and Surg. Journal*, 1873, p. 599.

belief that many such tumours have been described as exostoses of the antrum. Thus M. Michon removed from the antrum of a Frenchman, aged nineteen years, at the Hôpital de la Pitié (without an anæsthetic), the large odontome represented in Fig. 35. The operation, which may be described as a "surgical struggle," lasted upwards of an hour and a quarter.

The tumour is described as an exostosis, but fortunately M. Michon's account is accompanied by some excellent figures which show clearly enough that the tumour is an odontome. The cut surface exhibited a laminated disposition. Microscopically it was composed of tissue presenting many parallel tubules having the appearance of exaggerated dentinal tubes. It is the largest odontome but one from man of which we have any record; its weight is 1,080 grains.*

A tumour almost parallel with that of M. Michon has been described by Dr. T. Duka,† by whom it was removed from a Mahomedan woman, aged twenty-six years, at Monghyr,

Fig. 36.—Composite odontome from the upper jaw. (*Nat. size.*) (*Dr. Duka's case.*)

Bengal. The woman had for six years suffered from a mucopurulent discharge from the right nostril, and was now anxious for relief. The case was regarded as one of necrosis, but after a "surgical struggle" lasting nearly an hour without

* Mem. de la Société de la Chir., Paris, 1850.

† Trans. Path. Soc., vol. xvii. 256.

chloroform, the tumour represented in Fig. 36 was withdrawn from the antrum. It had no connection with the surrounding tissues.

The tumour, which was regarded as an exostosis, was submitted to a committee of the Pathological Society. In its report this committee states that the bone tissue differs in character from that ordinarily seen in exostoses. An examination of the tumour, which is preserved in St. George's Hospital museum, and an inspection of the figures illustrating the above-mentioned report, show clearly enough that it is a composite odontome. Dr. Duka, in his account of the case, states that Dr. Allen Webb was of opinion that the nucleus was formed by a tooth-follicle escaping into the antrum of Highmore. This was a guess, but one not far short of the truth.

The largest odontome known to have grown in the human antrum, and which for many years has been regarded as an exostosis, is preserved in the museum of Guy's Hospital. It has an extraordinary clinical history which was recorded by Hilton.* (Fig. 37.)

The patient, a man aged thirty-six years, had a large osseous tumour occupying the antrum. The pressure of this tumour had caused the front wall of the antrum, with the integument and soft tissues covering it, to slough. The trouble was first noticed thirteen years before: as the cheek enlarged the eyeball became displaced and finally burst. For a long time the surface of the tumour was exposed, the suppuration being copious, and occasionally pieces of bone irregular in shape came away; at last, to the man's astonishment, the bony mass dropped out, leaving an enormous hole in his face. The general appearance of this tumour may be inferred from the accompanying sketch. It weighed nearly fifteen ounces, and measured 27·5 cm. (11″) in its greatest circumference. I have had an opportunity of investigating this tumour; it is remarkably hard, presents on section an ivory-like surface and, on close scrutiny, a number of closely-arranged concentric laminæ. (Fig. 38.) Sections ground thin and examined under the microscope show large numbers of lacunæ and canaliculi arranged in a very regular manner. I could not detect

* Guy's Hospital Reports, vol. i., p. 493, 1836.

dentine, and it is impossible, without mutilating the specimen, to be sure that no teeth are embedded in it.

As this tumour had no bony connections, occupied the

Fig. 37.—Large odontome which was spontaneously shed from the antrum; weight, nearly fifteen ounces. Hilton's case. (*From the Museum of Guy's Hospital.*)

antrum, and in the structure of its peripheral parts is so closely identical with odontomes which occur in horses, there need be no hesitation in believing that this particular tumour

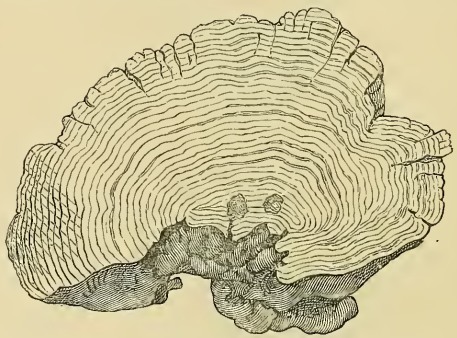

Fig. 38.—Section of the tumour represented in Fig. 37 to show the concentric lamination.

originated in one or more enlarged tooth-follicles, and is in fact an odontome.

Mr. Jordan Lloyd* has published an excellent account of an odontome of this class which he removed from the right upper jaw of a young man. As so often happens, the case was regarded as one of necrosis, but when removed from its bed was recognised as an odontome. The tumour (Fig. 39) weighed

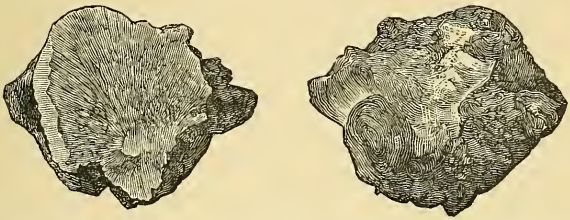

Fig. 39.—Composite odontome from the upper jaw. (*Nat. size.*) The left-hand figure shows the tumour in section. (*Mr. Jordan Lloyd's case.*)

279 grains; it is composed of osteo-dentine, with cementum here and there. Opaline, pearly patches are studded irregularly around the edge of the cut surface. The mass occupied the space of the second, and probably the third, right upper molars; it could be felt to be slightly loose before attempts were made to remove it. After its extraction a deep, round, smooth, velvet-like cavity remained, and the exposed part, with its crater-like hollow and surrounding ridge, bore a certain resemblance to a molar tooth crown.

The odontome represented in Fig. 40 was removed by Mr. S. Brock from a lad aged nineteen years; it was situated in front of the right upper bicuspid, displacing the lateral incisor and canine so as to occupy their position in the dental arch. As will be seen in the figure, it appears to consist merely of a crown and neck, but the crown bristles with cusps; as many as nine distinct enamel-covered eminences can be detected. Odontomes resemble teeth in this way—for a time during their development they remain hidden below the mucous membrane, and give little or no evidence of their existence. To this succeeds an eruptive stage, and the

Fig. 40.—Odontome from the upper jaw. (It is slightly enlarged in the sketch.)

* *Lancet*, 1888, vol. i., p. 64.

suppuration, with the constitutional disturbance dependent thereon, draws attention to them. This remarkable odontome had not only cut the gum but had taken a position in the dental series, and is further interesting in that it consists of a conglomeration of denticles, for I have urged that those remarkable cases in which denticles have from time to time been erupted from a tumour connected with the jaw should be classed as odontomes. It is easy to imagine that if the cusps of this odontome remained distinct, and each had been separately erupted, they would have been called supernumerary teeth. Indeed, many of the cusps can be easily detached from the main mass. Thus this strange specimen serves to bridge the gap between compound follicular and composite odontomes.

Treatment.—A study of the literature relating to odontomes is very instructive, for it serves to show that patients have in many instances been submitted to operations needlessly severe and dangerous. It is a curious fact that up to this date there is no instance on record in which an odontome, other than a follicular cyst, has been diagnosed before operation. In some cases the trouble has been regarded as due to necrosed bone, or unerupted teeth; in a few the tumours were regarded as exostoses, whilst several fibrous odontomes have been described as myeloid sarcomata.

In the case of a tumour of the jaw, the nature of which is doubtful, particularly in a young adult, it is incumbent on the surgeon to satisfy himself before proceeding to excise a portion of the mandible or maxilla that the tumour is not an odontome, for this kind of tumour only requires enucleation. In the case of a follicular odontome it is usually sufficient to excise a portion of its wall, scrape out the cavity, remove the tooth if one be present, stuff the sac, and allow it to close by the process of granulation.

CHAPTER V.

FIBROMATA.

Fibromata, or tumours composed of fibrous tissue, were formerly supposed to be very common, but careful histological research has shown that tumours consisting almost entirely of fibrous tissue are somewhat rare. For instance, it was the fashion to describe as fibromata those tumours of the uterus now known as myomata and fibro-myomata; traces of this belief linger still, for some yet write of them as "uterine fibroids." Many tumours now recognised as spindle-celled sarcomata were, a few years ago, named "recurring fibroid tumours." The difficulty of distinguishing between a myoma, a slowly growing spindle-celled sarcoma, and a pure fibroma is well known to skilled histologists; when a tumour composed of slender fusiform cells occurs in such an organ as the ovary, where myomata, fibromata, and sarcomata also occur, the distinction on histological grounds alone is often impossible.

In slow-growing fibromata there is not much difficulty, but in softer forms it often becomes a matter of importance to decide between a fibroma and a spindle-celled sarcoma. It is a matter of less moment to decide between a myoma and a fibroma, as both are innocent tumours, and it is probable that some uterine tumours begin as myomata and degenerate into fibrous tissue.

Typical fibromata are generally dense tumours consisting of wavy bundles of fibrous tissue. The bundles are composed of long, slender, fusiform cells closely packed together. The tissue of the tumours, often arranged in whorls, is permeated by bloodvessels.

Fibromata occur in the following situations:—The ovary, uterus, intestine, the gum (epulis), as laryngeal polypi, on the sheath of nerves (neuromata) and in the subcutaneous tissues as "painful subcutaneous tubercles"; and in the condition termed molluscum fibrosum.

There is a spurious form of tumour known as keloid which

stands in the same relation to a fibroma that an exostosis bears to an osteoma.

The chief species of fibromata are:—1, Simple fibromata; 2, molluscum fibrosum; 3, neuro-fibromata.

In this section simple fibromata, epulis, and molluscum fibrosum will be considered. Neuro-fibromata will be described with neuromata.

1. **Simple Fibromata.**—A most interesting and certainly a very frequent variety of fibroma is the small nodules so often met with in the subcutaneous tissues of the trunk, and especially the limbs, described and named by Wood* the *Painful Subcutaneous Tubercle* in the following words:—

"This disease consists in the formation of a tubercle of peculiar nature in the subcutaneous cellular substance. This tubercle is met with in different parts of the body, but most frequently in the extremities. It is extremely small, generally of the size and form of a flattened garden pea, and in none of the cases of which I have been able to procure a distinct account, larger than a coffee-bean. It is of firm consistence, and is apparently quite circumscribed, being situated loosely in the cellular substance, immediately under the integuments, which retain their natural colour and appearance. In the greater proportion of cases there is no visible appearance of disease whatever, and it is only when the surgeon applies his finger to a particular spot pointed out by the patient that he becomes sensible of the existence of the tubercle. In some few cases, however, although small, it is so superficially seated as to form a visible prominence.

"As in all the cases with which I am acquainted, the tubercle had attained nearly its full growth before its presence was detected. I am unable to say whether it is originally of slow or rapid formation; but having acquired a certain size, it remains nearly stationary, undergoing hardly any perceptible increase of bulk, even in the course of a great many years; nor does it ever show any tendency to affect either the skin or surrounding cellular substance.

"Trifling as the diseased part is, in point of size and appearance, it becomes the cause of very severe and even excruciating

* *Edin. Med. and Surg. Journal*, 1812, p. 283.

pain. So strongly is this pain represented by the patients that we might be apt to imagine their statement exaggerated, did we not find them all concurring in the same representation.

"The pain is extremely acute in the tubercle, and extends from it to a considerable distance along the neighbouring parts; it is not constant, but occurs in paroxysms. In general, at the commencement of the paroxysm, the pain is slight, but gradually increases until it becomes excruciatingly severe, and it goes off in the same gradual manner, leaving the parts in the neighbourhood of the tubercle, for some time afterwards, sore to the touch, as if they had been bruised. The paroxysms vary in duration from ten minutes to upwards of two hours; but they seem to increase, both in frequency and severity, in proportion to the length of time the disease has existed.

"Some of the patients have occasional intervals of ease for days or even weeks; in others the paroxysms occur several times in the course of one day. They generally come on spontaneously, but in some of the cases they were sometimes induced by the friction of the clothes along the surface of the tubercle. They frequently attack the patient when asleep, in which case he is suddenly awoke by the severity of the pain.

"The degree of pain produced by touching the tubercle is different in different cases. Acute pain is produced at all times by the tubercle being accidentally struck against any hard substance.

"It is a singular circumstance that in all the cases which have come to my knowledge, with perhaps one exception, this species of tubercle occurred in females. It does not appear to be confined to any particular age, but is frequently met with at an early period of life, and I have known it to remain nearly unchanged for upwards of eighteen years."

Although these small painful tumours have been abundantly studied since Wood wrote his description of them, no advance has been made in our knowledge of them. It has been fully demonstrated that they are found four or five times more frequently in females than in males. From the extreme pain produced by these tubercles many have imagined that they must contain nerve-fibrils; but even with the elaborate

methods of modern histology no one has succeeded in demonstrating their existence. The removal of these little bodies at once arrests the paroxysms of pain.

Ovarian Fibromata.—Tumours, sometimes of large size, composed of fibrous tissue have, in a few rare instances, been demonstrated in the ovary. They may be regarded as pathological curiosities.

Uterine Fibromata.—Fibrous tissue often forms a very large proportion of many uterine myomata, and it has already been mentioned that some uterine tumours, apparently consisting of pure fibrous tissue, were probably in their early stages myomata or fibro-myomata.

Intestinal Fibromata.—From what is known, in the light of modern histology, of the nature of tumours springing from the walls of the intestine, it seems a fair inference that many specimens reported in older literature as "fibrous tumours" were in reality myomata.

Laryngeal Fibromata.—Small polypoid outgrowths have in a few instances been removed from the mucous membrane of the larynx: on microscopical examination they were found to consist of pure fibrous tissue.

Epulis.—This is a term which formerly had a wide significance. It was applied to almost any tumour growing upon the gums; but when the microscope was employed to assist in the classification of tumours it was found that some epulides were sarcomatous, others fibrous, a few myxomatous, and so on. As a consequence the term came to have merely a topographical significance. It will be wise to restrict the term to tumours composed of fibrous tissue arising from the gums, or from the periodontal membrane. These tumours either arise in connection with the root of a decayed tooth, or from the retained root of a carious tooth hidden by the gums. An epulis of this character is made up of fibrous tissue covered externally with the gingival mucous membrane; it may be pedunculated or sessile, and occasionally two may be present. When freely excised and the stump, or carious tooth, with which the epulis is invariably associated removed, it rarely ever returns. Although an epulis is seldom larger than a walnut, it may attain a size equal to the closed fist. Such a tumour will exercise great pressure upon the dental arches,

distort the cheek, alter the shape of the maxilla and mandible, encroach upon the palate, and even protrude between the lips.

2. **Molluscum Fibrosum.**—This extraordinary condition of the skin and subcutaneous tissue has been described under such names as *Fibro-cellular Tumour*, *Dermatolysis*, and *Pachy-*

Fig. 41.—Case of molluscum fibrosum. (*After Mott.*)

dermatocele. The chief features of the disease consist of an overgrowth of the skin and subcutaneous tissue, which will affect a small area like the scalp, or may involve a large extent of skin on the trunk and limbs, causing it to hang in pendulous folds. Sometimes molluscum fibrosum assumes the form of discrete nodules scattered over the skin; these nodules vary in size, the extremes being represented by a pea and a walnut.

This variety of the disease is sometimes associated with similar nodules (neuromata) scattered upon the sheath of nerves in various parts of the body. (Plate III.) Exceptionally the pendulous and nodular lesions occur in the same individual.

The histology of the nodules and the pendulous flaps is similar; the condition appears to be due to an overgrowth of the fibrous tissue of the skin and subcutaneous tissue. Concerning the cause of this overgrowth nothing is known; the disease is not confined to any clime or race, for it has been observed in North America, the British Isles, Germany, and in natives of the West Coast of Africa.

The most remarkable series of cases of this nature is recorded by Valentine Mott* under the name of *Pachydermatocele*. One case will serve as a type. The patient, a single lady forty-five years of age, when she came under Mott's care had a large tumour of a copper colour, soft and elastic to the touch, and forming five folds or convolutions, as represented in Fig. 41. This mass was attached to the skin directly under the lobule of the ear, to the side of the neck, the thorax, and abdomen as low as the umbilicus; it extended down the arm to the insertion of the deltoid.

The mother of the patient stated that the tumour had been noticed soon after birth. The woman was anxious to have the mass removed. During the operation many arteries required ligatures, and some were of considerable size; two very large veins were seen, which Mott describes as the largest superficial veins he had ever seen; they terminated in the subclavian. The patient recovered, notwithstanding two attacks of erysipelas during convalescence. Five years later the patient was in perfect health, and there had been no recurrence of the tumour. Unfortunately no careful account of the histology of the tumour is forthcoming beyond the statement that "the specimen appears to consist of a hypertrophy of the skin and of the subcutaneous cellular tissue."

Lamprey† recorded a case of dermatolysis which he observed in a negro in a street of Sierra Leone. He was successful in obtaining a photograph. (Fig. 42.) A large mass of skin hangs in folds from the back and left side

* Medico-Chir. Trans., vol. xxxvii., p. 155.

† *Brit. Med. Journal*, 1892, vol. i., p. 173.

of the head, and falls over the left shoulder and back. In addition to the scalp tumour there are numerous nodules on the skin of the trunk, legs, arms, and face, varying in size from a peppercorn to a billiard-ball, some of which had

Fig. 42.—Native of Sierra Leone, aged fifty, with molluscum fibrosum. (*After Lamprey.*)

ulcerated. The man stated that he was born with lumps on his skin.

As the case resembled, in some respects, *elephantiasis*, the blood was obtained at seven p.m. from one of the tumours, and carefully examined for filariæ, but with negative results.

For other cases of this disease the following references may

be consulted.* The disease appears to be equally common in women and men. The frontispiece to Band I. of Virchow's "Die Krankhaften Geschwülste" represents a case of dermatolysis associated with a multitude of cutaneous nodules in a woman forty-seven years old, under the title of "fibrosum molluscum multiplex."

Keloid.—This term is applied to formations of dense fibrous tissue which arise in cicatrices of the skin. A keloid

Fig. 43.—Keloid in the lobule of the pinna, associated with an ear-ring puncture.

projects above the surface of the skin sometimes to the extent of a centimetre; its surface is quite smooth, and may be white or shining, or pink from the number of dilated vessels coursing over it. Sometimes the tumour has a regular outline, but, as a rule, it sends out spurlike processes into the adjacent skin; structurally it is identical with cicatricial tissue. Though originating in scars, keloid is not always limited by the scar in which it arises, but it rarely transgresses to any great extent

* Flower, *Lancet*, 1860; Treves, Trans. Path. Soc., vol. xxxvi. 494; Wright, Trans. Path. Soc., xvi. 269; Pollock, Trans. Path. Soc., xxvi. 219.

upon the healthy skin. When a keloid is excised, in the majority of cases it returns as the wound heals, and very generally the scars of the stitch-holes become the seats of keloid also.

The conditions which favour the production of keloid are unknown; it occurs fairly frequently in the scars left by burns,

Fig. 44.— Unusual case of keloid in a coloured woman. (*After Taylor.*)

but it will ensue on almost any kind of injury to the skin. It has been observed in the scars left by small-pox, by vaccination, primary and secondary; in acne scars and the scars of leech-bites; it has been frequently observed in cicatrices the result of surgical operations, and in the coarse stripes left by the severe use of the lash. It has been frequently observed in the lobule of the pinna in the punctures made for ear-rings, in white and

especially in black races of mankind (Fig. 43), and it also occurs in the scars left by syphilitic lesions. Keloid has been observed before the tenth year of life, but this is uncommon; it is most frequently met with in adults, and becomes very rare in old age.

The tumour, when it makes its appearance, slowly progresses up to a certain point, remains stationary for an indefinite period, in some cases lasting for ten, twenty, or even thirty years, then slowly disappearing. It is said that involution of keloid occurs quicker in the young than in those advanced in life.

In describing keloid it is customary to distinguish a true or spontaneous keloid and a false keloid. The true variety was supposed to arise independently of a scar, but clinical observation has shown that it often arises in scars left by such slight injuries, that it is very reasonable to believe that the supposed spontaneous keloid arose in scars whose existence had been forgotten.

Taylor* has described a very extreme example of keloid which came under his observation in a coloured woman twenty-three years of age. (Fig. 44.) When ten years old this patient suffered many hardships, and was the drudge of the family; she was required to go into the woods for fuel, and, having no clothes above the waist, was frequently torn in linear stripes by the bushes and briars. In the scars resulting from these injuries the keloid masses shown in the figure developed. The growth on the pinna formed around a hole made for an ear-ring. This tumour has been three times removed, and has re-formed after each operation.

* *New York Med. Journal*, Jan. 7, 1893.

CHAPTER VI.

MYXOMATA.

A **myxoma** is a tumour composed of mucous tissue identical with that which surrounds the vessels of the umbilical cord.

This genus contains three species :—

(1) Nasal and aural polypi ; (2) Cutaneous myxomata ; (3) Neuro-myxomata.

Myxomatous tissue is often the result of degenerative changes in cartilage, muscle, sarcomatous and fibrous tissues. Some writers hold the opinion that giving a myxoma the rank even of a species is not justifiable.

1. **Nasal Polypus.**—This species is the purest form of myxoma ; it grows from the mucous membrane covering the turbinal bones, and occasionally from the mucous lining of the frontal sinuses, and rarely from the mucous membrane of the antrum. Nasal polypi—for they usually occur in multiples—hang in the nasal fossæ as soft gelatinous tumours of a greyish-yellow colour. Each polypus may consist of a single lobule attached to the mucous membrane of a turbinal bone by a narrow peduncle. Not infrequently a polypus may be racemose, a number of lobules being attached by a common stalk. The number of polypi varies greatly ; exceptionally only one is present ; often six or more will be found. They may be confined to one nasal fossa ; more often both fossæ contain polypi. When they are very numerous and not interfered with, the nasal passages are expanded, and the polypi are visible at the anterior nares, or project through the posterior nares, and block up the naso-pharynx, forming pendulous masses behind the soft palate. Sometimes a polypus will extend so low as to reach the level of the aryteno-epiglottic folds. In the rare instances of myxomata occupying the frontal sinus, they cause a peculiar bulging at the inner angle of the orbit like that produced by distension of this sinus with fluid.

A nasal myxoma has an external capsule of mucous

membrane covered with epithelium, which may be of the columnar (ciliated) or stratified variety. Sometimes two varieties will be detected on the same tumour. Stratified epithelium is common on the exposed parts of a polypus. The bulk of the tumour is composed of myxomatous tissue traversed by numerous blood-vessels. On microscopical examination it resembles very œdematous connective tissue; the cells possess long slender processes which interlace with those of adjacent cells.

Nasal myxomata are rare before puberty, and, though most frequently met with in young adults, are by no means rare in individuals of middle age.

Aural Polypus.—Small myxomata grow from the mucous membrane of the tympanum, and constitute one variety of aural polypus; when large enough to block up the tympanic cavity or occlude the external auditory meatus, they produce deafness. At birth the tympanum is filled with delicate fœtal connective tissue and the ear-bones are embedded in it. As pulmonary respiration becomes established this tissue slowly disappears, and air from the pharynx gradually gains access to the tympanum by way of the Eustachian tube. Jacobson* has suggested that aural myxomata may in some instances arise from vestiges of this connective tissue.

2. **Cutaneous Myxomata.**—These occur either as sessile or pedunculated tumours. They are by no means common. Some of the most typical cases that have come under my observation presented themselves as sessile tumours in the loin, but not extending beyond the deep fascia. When divided, the surface of a pure myxoma resembles a mass of transparent trembling jelly; a viscid fluid, sometimes of a pale straw colour, drains from it.

Pedunculated myxomata are most frequent in the neighbourhood of the perineum and labia. In young individuals they possess a regular, usually oval, outline. Later in life, as the fluid parts absorb, they assume the lobulated appearance shown in Fig. 45.

Sessile myxomata are very prone to recur after removal; in some instances it is very probable that they are sarcomata

* Guy's Hospital Reports, 1882, vol. xli. p. 217.

which have undergone myxomatous degeneration. Such a tumour is sometimes called *sarcoma myxomatodes.*

The pedunculated variety approximates in structure very closely to the pendulous cutaneous folds characteristic of molluscum fibrosum.

3. **Neuro-Myxomata** are described with neuromata in chap. xvi.

Myxomatous Disease of the Chorion.—It is usual in works on tumours to describe this interesting condition (the hydatid

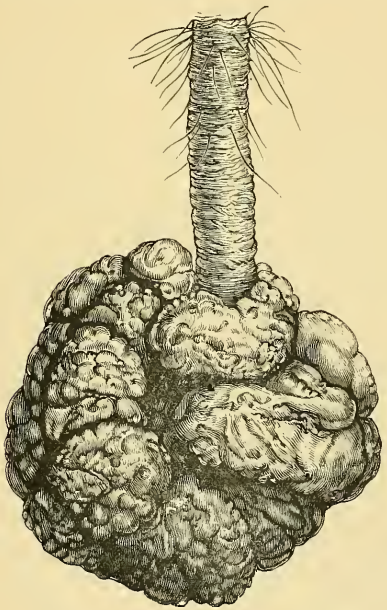

Fig. 45.— Pedunculated myxoma from the labium of a woman fifty years old : it had existed many years.

mole of midwifery); but as it does not in any strictness belong to tumours, it will not be considered further in this treatise.

Treatment.—Myxomata, like tumours in general, should be removed whenever their position and relations to surrounding structures permit. In the case of nasal polypi this plan of treatment is invariably adopted, and there are several methods of effecting their removal, such as snaring them with small wire snares, or detaching them with a galvano-cautery,

or avulsion with forceps. When the polypi are confined to the lowest and middle turbinals they are easily and completely torn away, but when they spring from the highest turbinal or occupy the ethmoid cells and frontal sinus, it is a difficult matter to eradicate them thoroughly.

Pedunculated myxomata, of the kind represented in Fig. 45, are easily removed; they never recur.

CHAPTER VII.

GLIOMATA.

A **glioma** is a tumour composed of delicate connective tissue identical with the variety known as neuroglia. This genus consists of a single species—glioma—which bears the same relation to the central nervous system that a plexiform neuroma bears to the peripheral nerves.

Gliomata occur only in the central nervous system. A tissue very similar to neuroglia forms the sustentacular framework of the retina. This is frequently the seat of sarcomata, which are often termed retinal gliomata. (*See* page 87.)

Gliomata of the Brain.—In the brain a glioma occurs as a tumour imperfectly demarcated from the surrounding tissue. It may appear as a translucent swelling of the consistence of vitreous humour, or it may be as firm as the tissue of the pons. As a rule, a glioma is of the same firmness as the cerebral cortex.

Structurally, gliomata consist of cells, containing one or more nuclei, furnished with delicate ramifying processes, mixed with fibrous tissue. The proportion of cells to the fibrous tissue varies greatly; sometimes one set of elements preponderates, sometimes the other. These tumours are often very vascular, the vessels being irregularly dilated and occasionally sacculated. The number of blood-vessels in some specimens is so great that the tumours are described as angeiomata or angeio-sarcomata.

As a rule, gliomata are solitary, and they do not give rise to secondary deposits. In certain situations they rather resemble diffuse overgrowths than tumours. Virchow pointed out that when a glioma is situated near the surface of the cortex it will appear like a colossal convolution. Should it grow in the tissue of an optic thalamus it would cause the thalamus to bulge into the third ventricle as though overgrown, and a glioma of the occipital lobe will project into the descending cornu like an additional thalamus. The best illustration of this indefiniteness so characteristic of a glioma

comes out very strikingly when the pons is occupied by this form of tumour.

Gliomata occasionally occur in the pons, and form tumours of considerable size. Sometimes they are confined to one side, and extend into the adjacent cerebellar crura. In a case described by Cayley,* which occurred in a child two years of age, a glioma as large as a walnut occupied the right half of the pons and extended along the superior cerebellar peduncle of that side, reaching as far forward as the corpora quadrigemina. The gliomatous mass formed a prominence on the corresponding half of the floor of the fourth ventricle, and obstructed the Sylvian aqueduct.

In some cases both sides of the pons are involved, and the overgrowth of neuroglia extends forwards into the cerebral crura and the cerebellar peduncles, and involves the corpora quadrigemina. In a few it extends downwards into the medulla, and may even involve the cervical portion of the cord, as in a specimen described by Whipham.†

Sometimes the gliomatous tissue is so abundant as to produce an enlargement of the pons and cerebral peduncles, as represented in Fig. 46. The appearance of such brains is very peculiar; the basilar artery and its branches appear as though sunk in deep furrows, which cause the parts to resemble "a soft package tightly corded" (Dickinson). Such cases are rare, and in nearly all instances the patients have been under twelve years of age. Thus the case recorded by Percy Kidd‡ occurred in a girl six and a-half years old. Gee's§ patient was a boy of nine years. In two cases described by Angel Money,‖ one was a boy of eleven years, and the other a girl of six and a-half years. Goodhart¶ has described a specimen from a boy aged nine years; Schulz** has observed one in a man of thirty-two years. The relations of a glioma to the surrounding tissues are best seen in recent specimens. On examination soon after

* Trans. Path. Soc., vol. xvi., p. 23.

† Trans. Path. Soc., vol. xxxii., p. 8.

‡ St. Barth. Hosp. Rep., vol. xiii., p. 272.

§ St. Barth. Hosp. Rep., vol. xvii., p. 285.

‖ Med.-Chir. Trans., vol. lxvi., p. 283.

¶ Trans. Path. Soc., vol. xxxvii., p. 14.

** Neurologisches Centralblatt, 1883, s. 5. This paper contains several references.

death the diseased parts are abnormally large, and on section exhibit a characteristic pale blue colour; in thin sections the tissue has a delicate translucent appearance. The tumour itself is very soft, and imparts to the fingers a sensation like fluctuation. When the parts are immersed in alcohol the tissue becomes firm, opaque, and white; under these conditions

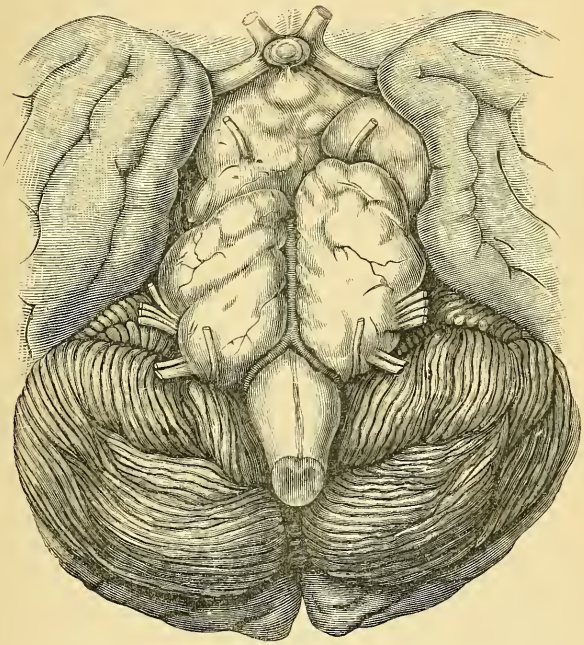

Fig. 46.—Bilateral gliomatous enlargement of the pons and crura cerebri. (*Angel Money.*)

it is particularly difficult to determine the limits of the tumour.

Gliomata of the Spinal Cord.—A glioma in the spinal cord is a very rare tumour, and, judging from the scanty records, it would appear that a glioma in the brain is twenty times more frequent than in the cord. The tumour is imperfectly demarcated from the nervous tissue, and often causes a general enlargement of the cord, producing an effect upon it like the gliomatous disease of the pons, crura, and medulla

depicted in Fig. 46. Reisinger* collected and epitomised the records of nineteen cases of glioma of the spinal cord, and adds a full description of a case which he observed; the report is accompanied by an account of the morbid anatomy of the parts by Prof. Marchand.

The disease may attack any part of the cord, but is most frequent in the cervical enlargement. In a few instances the tumour was seated in the lumbar region. It appears most frequently between the seventeenth and thirtieth years, but it has been observed as late as fifty. Sharkey† has published an interesting account of a spinal glioma which occurred in a man fifty years old, and he uses it to demonstrate the clinical fact that when a tumour arises within the cord, as gliomata always do, it disturbs its functions from the commencement; but, as the nerve substance appears to be elastic, and to allow a good deal of gradual stretching without serious interference with its functions, a tumour may continue to grow for a long time before it produces striking pathological phenomena (Fig. 47). When a tumour grows in the spinal canal outside the cord it may produce but few symptoms until it presses the cord against the resisting walls of the canal; after this has taken place the course of the disease is naturally very rapid, as the cord is quickly flattened by the constantly increasing demands for growing-space which are made by the tumour.

Fig. 47.—Spinal cord, in transverse section, from a case of glioma. The expanded nerve tissue forms a rim, or capsule, around the tumour (*After Sharkey.*)

The peculiar relation of the gliomatous tissue to the nerve tissue of the cord precludes any surgical interference.

* Virchow's "Archiv," xcviii. 369.

† Gulstonian Lectures, 1886.

CHAPTER VIII.

SARCOMATA.

The histological characters of **sarcomata** are those of immature connective tissue, in which cells preponderate over the intercellular substance. Clinically, sarcomata are distinguished from the preceding genera of tumours in that they rarely possess capsules, infiltrate the surrounding tissues and are prone to disseminate; their infiltrating propensities render complete removal a matter of difficulty, hence sarcomata are liable to recur. Such characters constitute **malignancy**. Sarcomata are arranged in species according to the shape and disposition of the cells.

1. Round-celled sarcoma.
2. Lympho-sarcoma.
3. Spindle-celled sarcoma.
4. Myeloid sarcoma.
5. Alveolar sarcoma.
6. Melano-sarcoma.

The round and spindle-celled species present varieties which will be particularised when each species is separately considered.

1. **Round-celled Sarcomata.**—This species is of very simple construction, and consists of round cells with very little intercellular substance. The cells contain a large round vesicular nucleus and a small proportion of protoplasm; the nuclei are always conspicuous objects in stained sections. Blood-vessels are abundant, often appearing as mere channels between the cells. Lymphatics are absent. Round-celled sarcomata grow very rapidly, infiltrate surrounding tissues, recur quickly after removal, and give rise to secondary deposits especially in the lungs.

There is a variety, known as the large round-celled sarcoma, in which the cells are of unequal size; some of them contain two or more nuclei; a few are multinuclear, and resemble myeloid cells.

The round-celled sarcoma is the most generalised tumour

that affects the human body: it may occur in any tissue, bone, brain, muscle, spinal cord, ovary, or testis, and even in the delicate sustentacular framework of the retina. It attacks the body at all periods of life, from the fœtus *in utero* and the

Fig. 48.—Microscopical appearance of a lympho-sarcoma from the mediastinum.

child just born up to the extreme limits of age. Among vertebrate animals it is almost ubiquitous.

2. **Lympho-Sarcomata** consist of cells identical with those of round-celled sarcomata, but the cells are contained in

Fig. 49.—Small spindle-celled sarcoma from a metacarpal bone.

delicate meshes: the tissue resembles that of lymphatic glands (Fig. 48), hence the origin of the term lympho-sarcoma. These tumours must not be confounded with simple (irritative) enlargement of lymphatic glands, nor with the general overgrowth of lymph-adenoid tissue associated with leukæmia or lymphadenoma (Hodgkin's disease).

3. **Spindle-celled Sarcomata.**—The cells of the species

classed under this head vary considerably in size, but they agree in the circumstance that they are oat-shaped (Fig. 49) or fusiform. The cells have a tendency to run in bundles, which take different directions, so that in sections of the growth seen under the microscope some cells will be cut in the direction of their length and others at right angles. This must be borne in mind, or an incorrect opinion will be formed as to the nature of the tumour.

Fig. 50.—Cells from a spindle-celled sarcoma of the neck of the uterus. Some of the cells present a cross-striation. (*After Pernice.*)

The following facts will afford some idea as to the degree of variation in size of the cells of spindle-celled sarcomata. In some of the tumours the cells are so thin and slender, and contain so little protoplasm that they seem to consist only of a nucleus and cell processes. It is difficult to distinguish such cells from those of moderately firm fibrous tissue.

In other specimens the cells are large, beautifully fusiform, and rich in protoplasm. Such cells give rise to considerable difficulty to the morbid anatomist, and he often feels incompetent to decide between them and those of young

unstriped muscle-fibre. The complexity of such tumours is further increased by the fact that occasionally these long spindle-cells are transversely striated like voluntary muscle fibre. (Fig. 50.) This variety of sarcoma is known as myo-sarcoma (rhabdomyoma).

Another peculiarity of spindle-celled sarcomata is the frequent presence of tracts of immature hyaline cartilage: indeed in many instances this tissue constitutes so large a proportion of the tumours that they are described as chondromata; the cartilage is sometimes calcified and even ossified. It may seem strange to associate tumours containing striped cells and cartilage with sarcomata, but the correctness of the classification is demonstrated by the fact that such tumours are apt to recur after removal, and in some of the cases in which the primary and recurrent tumours have been carefully examined, the primary tumour has contained cartilage, or muscle, whilst the recurrent mass has shown no evidence of these tissues, but has conformed to the structure of a pure spindle-celled or a round-celled sarcoma. In order, therefore, to indicate the nature of such composite sarcomata they will be referred to as myo-sarcomata (rhabdomyomata) and chondro-sarcomata. Spindle-celled sarcomata often contain round and even multinuclear cells.

In slow-growing spindle-celled sarcomata the cells sometimes become converted into fibrous tissue; such tumours are often termed fibro-sarcomata or fibrifying sarcomata.

4. **Myeloid Sarcomata.**—This species is composed of tissue histologically resembling the red marrow of young bone. Myeloid sarcomata usually occur in the long bones and are of a deep red or maroon colour, and, when fresh, the cut surface looks like a piece of liver. The tissue contains large numbers of multinuclear cells embedded in a matrix of spindle or round cells. Many central tumours of bone contain multinuclear cells, but it is only when these large cells are present in such quantity as to make up a large part of the tumours that they should be classed as myeloid sarcomata. (Fig. 51.)

5. **Alveolar Sarcomata.**—This is a peculiar species of tumour in which the cells, contrary to the rule of sarcomata, generally assume an alveolar arrangement which mimics very strongly the disposition of cells characteristic of cancer. In

carefully prepared sections such tumours rarely cause difficulty because the cells are usually of large size, and even when they resemble epithelium it is possible to distinguish a delicate reticulum between the individual cells, a condition never found in cancer.

Alveolar sarcomata have occasionally been described as growing in connection with bone, but their common situation is the skin, especially in relation with those congenital defects

Fig. 51.—Myeloid sarcoma from the acromial end of the clavicle.

known as hairy and pigmented moles. The peculiarities of this species will be more fully considered in the chapter devoted to melano-sarcomata.

6. **Melano-sarcomata.** — Structurally this species may be composed of round or spindle cells, and they may sometimes be arranged in alveoli; the distinguishing feature is the presence in the cells and in the intercellular substance of a variable quantity of black pigment.

The Blood-Supply of Sarcomata.—The vascularity of sarcomata varies greatly; in all, the circulation is mainly capillary. In the small round-celled sarcomata the vessels are so numerous as to cause a distinct pulsation and a bruit,

whilst in the slow-growing spindle-celled varieties—especially those undergoing chondrification — the vessels are not numerous, and the tumours on section are of a white colour. It has already been pointed out, in describing the minute structure of sarcomata, that the walls of the vessels are very thin, and are often so attenuated as to resemble channels between the cells. This explains the frequency of hæmorrhage within the soft and rapidly growing varieties. Repeated extravasations of blood will sometimes convert these tumours into cysts containing blood intermixed with sarcomatous cells. Tumours transformed in this way were formerly described as malignant blood-cysts.

Although the vessels in a sarcoma are, in the main, capillaries, nevertheless the arteries supplying the tumour may be very large and numerous. When a sarcoma grows from the distal end of the femur and attains a large size, arteries supplying it from neighbouring muscular, periosteal, and articular trunks become important branches, and in such circumstances an incision into the tumour will be attended with alarming hæmorrhage. When attempts are made to dissect out such a tumour from the limb instead of adopting more radical measures, such as amputation, these enlarged vessels must not be forgotten, or they will intrude themselves upon the surgeon in a very unmistakable manner. Arteries which, under ordinary conditions, are almost inappreciable, will, when nourishing a sarcoma, attain the dimensions of the radial or even larger trunks.

Dissemination.—Sarcomata are liable to reproduce themselves in distant organs, a phenomenon frequently referred to as metastasis. This dissemination takes place mainly through the veins because, as has already been mentioned, sarcomata are devoid of lymphatics. The most common organ in which to find secondary sarcomata is the lung, unless the primary growth is situated in the territory of the portal circulation, then they will be found in the liver. In very malignant sarcomata, especially the small round-celled species, secondary deposits may form in any organ of the body. Secondary nodules are always identical in structure with the primary tumour.

The Infiltrating Properties of Sarcomata.—The tendency

to extensively infiltrate the planes of connective tissue adjacent to the tumour is not peculiar to sarcomata, for it is observed in carcinomata. This property, so far as sarcomata are concerned, comes out in a marked manner in the case of the voluntary muscles.

Sarcomata occur in voluntary muscles under three conditions :—

1, Primary tumours ; 2, Infiltrations from adjacent tumours ; 3, secondary deposits.

Primary sarcomata of muscles are very rare: they may be of the round-celled or spindle-celled species. For a time at least the tumour is limited by the sheath of the affected muscle. At first the disease appears localised to a particular spot of the muscle, but it gradually extends until the whole belly of the muscle is involved, and becomes transformed into an indurated mass. On section the muscle-tissue appears replaced by hard, tough material of a pale grey colour. When sections are examined under the microscope the appearance is very striking, for each fasciculus is isolated from its neighbour by collections of cells (usually round cells) characteristic of the sarcoma.

Primary sarcomata have been observed in the following muscles :—Pectoralis major, rectus abdominis, peroneus longus, gracilis, tensor vaginæ femoris, adductor brevis, sartorius, tibialis anticus, and the triceps.

Infiltration of muscles by sarcomata is by no means rare. For instance, when a retinal sarcoma protrudes through the posterior part of the sclerotic and invades the orbit, it sometimes makes its way into the sheaths of the recti and converts them into masses resembling yellow wax; on section the various fasciculi will be found isolated by the cells of the sarcoma.

Periosteal sarcomata often invade muscles, and this is easily comprehended when the intimate relations of muscles to periosteum are remembered. Thus in Fig. 55 a sarcoma springs from the fibula and involves the origin of the flexor longus hallucis and the peroneal muscles. In a similar way I have seen the adductor muscles invaded by a periosteal sarcoma springing from the upper third of the shaft of the femur, and it doubtless occurs in most cases in which sarcomata spring from bone near the origin or insertion of muscles.

Secondary deposits of sarcomata in muscles are occasionally seen where there is wide dissemination of the disease; in such cases scarcely an organ escapes, and nodules may even occur in the heart. Care must be exercised not to confound a syphilitic gumma in a muscle with a sarcoma.

The Burrowing Tendencies of Sarcomata.—All tumours in their growth tend to follow the lines of least resistance, and thus enter into nooks and crannies in the most unexpected manner. Every surgeon knows how a sarcoma of the maxilla will send processes into the spheno-maxillary fossa and creep through the foramen rotundum, to appear in the cranial cavity. Sarcomata springing from the heads of the ribs or processes of the vertebræ have been known to extend through intervertebral foramina and compress the cord, giving rise to fatal paraplegia. In one case the tumour has been removed, and the patient recovered motion and sensation.*

This burrowing tendency comes out very strongly in the case of lympho-sarcomata growing in the mediastinum. (*See* page 104.)

It is also remarkable what slender barriers will serve as checks to sarcomata. For example, it is no uncommon condition to find one of these tumours springing from the periosteum near a joint extend in all directions and envelop the synovial membrane, yet be prevented by it from invading the joint.

The Relation of Sarcomata to Veins.—It has long been recognised that when sarcomata become disseminated the secondary tumours occur in situations which indicate that the distribution has been effected by means of the veins. Attention has already been drawn to the tendency which seems inherent in most species of sarcomata to burrow: this tendency comes out in a striking way when studied in connection with veins.

Perhaps the simplest form occurs in the eyeball. When a melanoma arises in the uveal tract, especially when the tumour is in close relation with the choroid, it remains for a period restricted to the interior of the globe, until it produces such changes in the intra-ocular tension that the cornea sloughs and the growth protrudes externally. In many of these specimens, if the sclerotic be carefully examined in the situations where

* Davies-Colley, Trans. Clin. Soc., vol. xxv. 163.

the venæ vorticosæ pierce it, small nodules of the tumour will be detected projecting through these openings, having made their way out by burrowing in the sheaths, and, in some cases, actually travelling along the lumina of the veins.

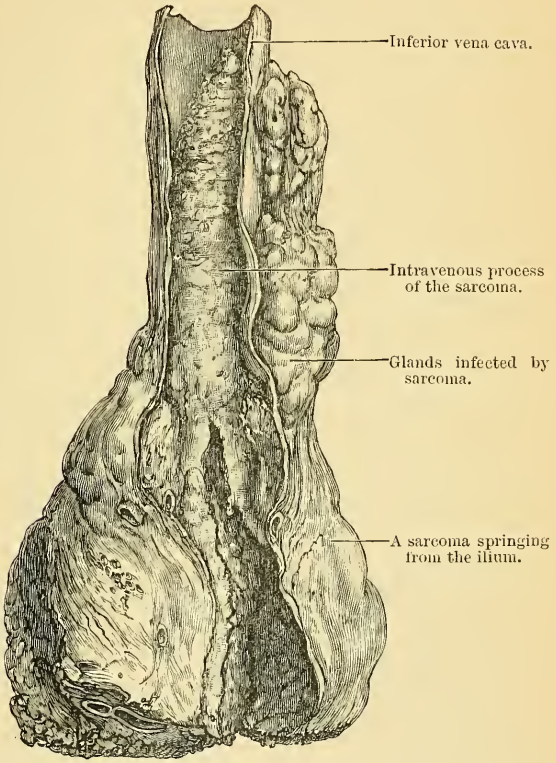

Fig. 52.—Periosteal sarcoma of the ilium invading the inferior vena cava. (*Museum, St. Bartholomew's Hospital.*)

The relations of sarcomata to veins come out strongly when these tumours affect bones. In some examples of periosteal sarcomata the medulla is invaded by processes of the tumour making their way along the veins traversing the Haversian canals. The converse of this is also true, for a central sarcoma will sometimes implicate the periosteum by way of the Haversian canals.

It is well established that most examples of central sar-

comata occur near the joint ends of bones, and yet it is exceptional to find the joints invaded. When joint invasion happens, it occurs late in the course of the disease, and then, in most cases, the tumour creeps in through the synovial membrane. This comparative immunity of joints is usually attributed to the articular cartilage acting as neutral tissue; but it appears rather to be due to the fact that the cartilage, unlike the compact tissue of bone, is not traversed by a multitude of narrow venous channels. Extraordinary examples of the invasion of veins by sarcomata occur in the abdomen. In cases of renal sarcomata processes of tumour will find their way into the renal vein, and thus gain the inferior vena cava. Periosteal sarcomata of the pelvic surface of the ilium are very liable to infiltrate the iliac veins and extend into the vena cava. (Fig. 52).

This specimen illustrates very well the general relation of an intravenous outrunner from a sarcoma; the process lies freely in the lumen of the vein, its apex is smooth and rounded, and there are no lateral adhesions save in the situations where the main mass of the tumour infiltrates the wall of the vein. The portion of the sarcoma situated within the vein is, as would be expected, structurally identical with the main mass of the tumour, and has its own blood-vessels, which are continuous with those of the sarcoma.

Such a large invasion of a venous trunk as is represented in Fig. 52 is unusual, but it is by no means rare to find a small portion of a sarcoma projecting into the lumen of a vein to the extent, perhaps, of 2, 3, or 4 cm.

When processes from a sarcoma project into a vein, the circulating blood is apt to detach large fragments, and these become dangerous emboli. Thus Osler* has recorded an example of renal sarcoma with intravenous processes in which so large a piece was detached, carried forward, and arrested at the right auriculo-ventricular orifice that it speedily killed the patient, a child three years old.

The mere presence of a sarcomatous outrunner in a vein does not necessarily imply dissemination of the sarcoma, for very large intravenous processes may exist, and the lungs be free from any gross lesion of a sarcomatous nature. On the

* *Journ. Anat. and Phys.*, vol. xiv., p. 230.

other hand, a very small invasion may lead to extensive infection of the lungs, especially if the protruding surface of the tumour be eroded by the blood current.

Dr. Pitt* has described a case in which a man with sarcoma of the thyroid gland died suddenly. At the post-mortem examination the cavities on the right side of the heart contained fragments of growth embedded in clot; on dissection it was ascertained that the sarcoma had ulcerated into the internal jugular vein.

When a vein is invaded by a sarcoma, and discharges of emboli frequently occur, they easily traverse, when small, the right auricle and ventricle, but are too large to pass through the pulmonary capillaries; hence the small vessels in the lungs act as filters, and these arrested particles become secondary foci, and may attain the size of cob-nuts.

It is possible that sarcomata may originate in the walls of a vein and extend along its lumen. Griffiths† has recorded a case of this kind in connection with the internal jugular vein.

Secondary Changes.—Sarcomata are very prone to degenerative changes; for instance, hæmorrhage is very apt to take place in those which grow quickly, producing spurious cysts. The tissues of the tumour are apt to liquefy, and myxomatous changes are very common. Calcification occurs in those which grow slowly, especially if connected with bone. When sarcomata grow rapidly and involve the skin, ulceration is very prone to occur, and leads to profuse and oft-repeated hæmorrhages, which not only exhaust the patient, but in many cases induce death.

Occasionally considerable portions of a sarcoma will necrose; this is more apt to occur in very large tumours. In such cases a large spurious cyst forms in the sarcoma, and on cutting into it the fluid escapes, with large irregular pieces of the tumour, which are generally of a greyish-white colour. When necrosis occurs extensively in a large sarcoma it will sometimes check its course in a very marked manner.

* Trans. Path. Soc., vol. xxxviii. 398. *See* Paget's classical case, Med.-Chir. Trans., vol. xxxviii. 247.

† Trans. Path. Soc., vol. xxxix. 311.

CHAPTER IX.

SARCOMATA (*continued*).

As connective tissue occurs in every organ of the body, so **sarcomata** are anatomically ubiquitous; but they occur in some situations more commonly than others. They frequently grow from the subcutaneous tissue and fascia, intermuscular septa, periosteum and marrow of bone, the testis, ovary, and salivary glands; occasionally they grow in the brain, spinal cord, and sheaths of nerves. They are rare as primary tumours of the liver or lung, spleen, alimentary canal or uterus; sarcomata grow from the retina and uveal tract, and are fairly frequent in connection with congenital defects of the skin.

In order to indicate the peculiarities of sarcomata it will be necessary to consider them in relation with the affected organs, and this will allow their clinical features to be systematically dealt with.

Sarcomata of Bone.—When arising from the periosteum these tumours are spoken of as periosteal or peripheral sarcomata; those which grow from the interior of the bone are termed central sarcomata.

1. **Central Sarcomata** may arise in the middle of the shaft of a long bone, but more frequently they originate in the cancellous tissue near the joint-ends of the bone. Sarcomata arising in the diaphysis belong, as a rule, to the round-celled species. Those which grow at the extremities are generally spindle-celled, and contain a variable quantity of myeloid cells; cartilage is sometimes present. They occur at any age, but are most frequent between ten and forty, and are more common in the long bones of the lower than in the corresponding bones of the upper limb.

When a tumour occupies the centre of the diaphysis its growth causes expansion of the osseous boundaries, and produces a rounded or spindle-shaped swelling, and the bone may become so thin that, upon some slight exertion, it breaks. In cases where the tumour affects the extremity of the bone it will, in young subjects, infiltrate the epiphysis, but it rarely

transgresses the articular cartilage: hence the contiguous joint is rarely invaded by a central sarcoma.

Central sarcomata rarely affect the adjacent lymph-glands. In exceptional cases, especially with small round-celled sarcomata, the cells will make their way along the Haversian canals and form a tumour beneath the periosteum. Central sarcomata lead to enlargement of the surrounding bone; hence when the soft tissues are removed by maceration a large bulb-like, osseous mass is left. These specimens are common in pathological museums. (Fig. 53.) In some cases this osseous capsule is so thin that the tissue of the tumour makes its way through, and as it is very vascular a strong rhythmical pulsation (accompanied by a bruit) is perceptible over the protruding portion.

Myeloid sarcomata are always central tumours, and, like the spindle- and round-celled species, cause expansion of the bone. These tumours have a characteristic maroon colour; they rarely exceed a fist in size, grow with extreme slowness, and are the least malignant of all the species of sarcomata.

2. **Periosteal Sarcomata.**—These are often referred to as parosteal, or peripheral sarcomata. They may be round-celled or spindle-celled (never myeloid), and are liable to the various metamorphoses and degenerations affecting sarcomata generally, but are more liable to calcification and ossification than central tumours. They occur earlier in life than those of the preceding class, and are frequently associated with antecedent injury. They do not, as a rule, invade joints, but now and then portions of them are conveyed into the adjacent articulation along the ligaments.

When growing from the periosteum near the middle of the shaft, a sarcoma may be restricted to a portion of its circumference or entirely surround it, producing a fusiform swelling. In such specimens the shaft of the bone traverses the tumour and may, beyond a slight amount of erosion, be unaffected by it. In such a case, however, the medulla may be infected by the cells making their way along the Haversian canals. Periosteal like central sarcomata have a greater predilection for the joint-ends of the bone than for the central portion of its shaft.

In size periosteal sarcomata vary greatly; sometimes they

are of the dimensions of an orange, and they have been recorded measuring 1 m. (40″) in circumference; they do not, as a rule, lead to fracture of the bone from slight

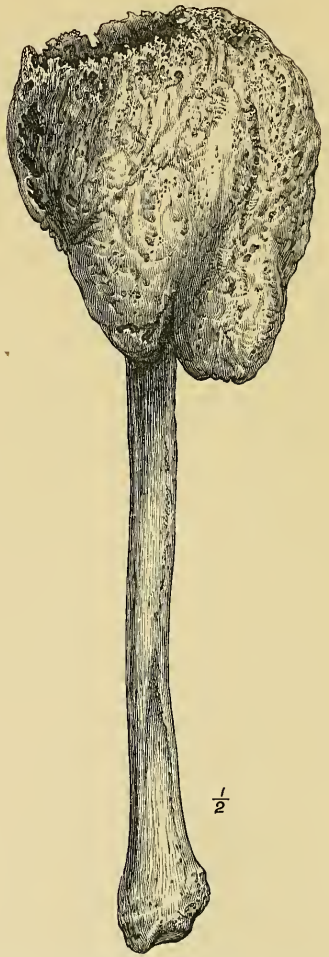

Fig. 53.— Spina ventosa of the fibula. (*Museum, Middlesex Hospital.*)

causes, as is the case with central tumours. Many of them become more or less ossified; the ossific tracts may assume the form of spicules, as in Fig. 54, or the tumour is traversed by an osseous mesh, the spaces being filled

with sarcomatous tissue. In some instances the affected bone is greatly thickened in the parts related to the tumour. The extensive ossification associated with periosteal sarcomata is

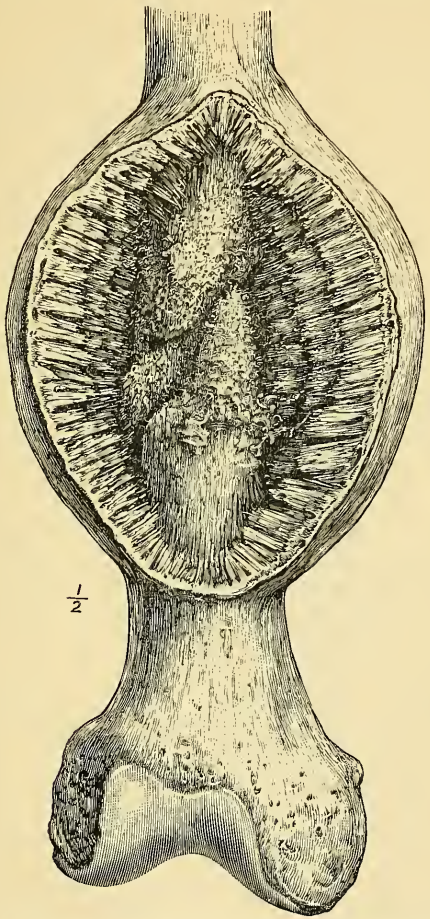

Fig. 54.—Skeleton of an ossifying periosteal sarcoma of the femur.

not a matter for surprise when we remember that bone-making is the essential function of periosteum. The crystal-like spicules so frequently found in these tumours doubtless represent ossifications of the fibrous trabeculæ which normally connect the periosteum with the compact tissue of the bone.

As the periosteum is raised from the bone by the growing tumour these trabeculæ elongate and afterwards ossify into spicules.

After this general survey of sarcomata affecting bone it will be useful to briefly consider the liability of the various bones to these tumours.

Of all bones the **femur** is the one most liable to sarcomata, central as well as peripheral; the tumours are most frequently associated with its lower third, and invariably run a rapidly fatal course, especially those which spring from the periosteum. The duration of life rarely exceeds eighteen months; often it is very much less. They are most frequent between the age of fifteen and forty years.

Sarcomata are fairly common in the **tibia**: they prefer the upper to the lower end, and do not run such a rapid course as those of the femur, and appear somewhat later.

The **fibula** is not often attacked: the upper end of the bone is the favourite situation, but periosteal sarcomata may spring from any part of its shaft. (Fig. 55.)

Sarcomata of the shaft of the **humerus** are very deadly tumours, and occur at all ages, from infancy to extreme old age. They generally involve the whole of the diaphysis, and form large, soft, rapidly-growing, carrot-shaped masses. Central tumours of the humerus usually attack the upper end.

The **radius** and **ulna** are occasionally the seat of sarcomata; the periosteal tumours grow from the middle of the shafts, whilst the central varieties exhibit a partiality for the lower extremities. *Sarcomata of the clavicle, sternum, the bones of the hands and feet, and the ribs are excessively rare.* Sarcomata of the **ribs** usually spring from the neck or head of the bone, and are liable to send processes through the intervertebral foramina and compress the cord.

The **scapula** and **hip bone** are sometimes attacked by sarcomata. In the case of the scapula the tumour usually springs from the body of the bone; exceptionally, the seat of origin has been the coracoid process. Of the various parts of the hip bone the ilium is most often attacked. The skull bones are by no means uncommon situations for sarcomata, but they are attacked much later in life than the long bones.

Of the various bones of the skull, two call for especial mention—viz., the maxilla and mandible.

Sarcomata of the Jaws.—Although it is customary to speak of tumours connected with the maxilla or mandible

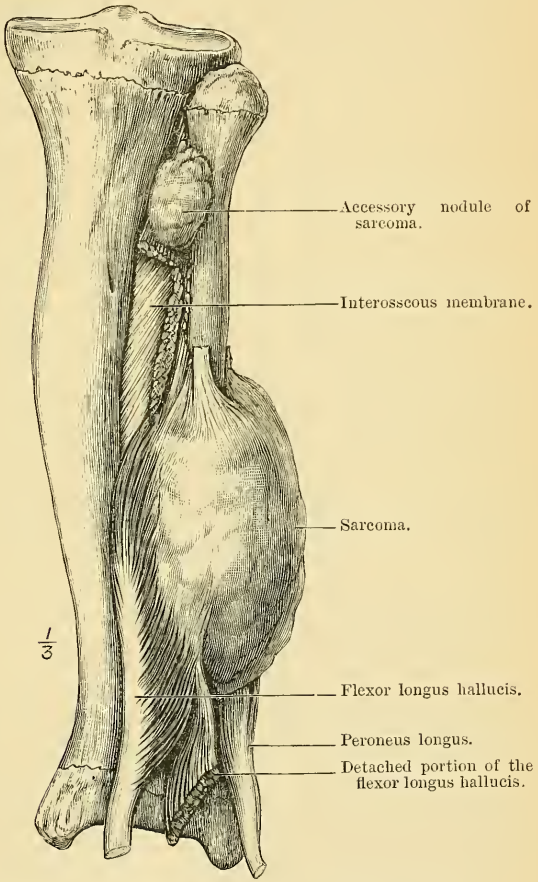

Fig. 55.—Spindle-celled sarcoma of the fibula. (*Museum, Middlesex Hospital.*)

clinically as tumours of the jaws, it would be erroneous to describe them indiscriminately as tumours of bone.

In each jaw there are, in addition to the bone and its periosteum, two structures to consider—mucous membrane and teeth. In the case of the maxilla, the antrum must be

considered; in addition, the maxilla is liable to be invaded by sarcomata arising in the naso-pharynx, orbit, and nasal fossa.

Sarcomata of the jaws may arise from the periosteum or the muco-periosteum; in either case they are of the round-celled or spindle-celled species. When springing from the gums sarcomata are often spoken of as malignant epulides. The term epulis has only a topographical significance. Sarcomata arising in the follicles of teeth are often confounded with central tumours.

Periosteal sarcomata originate in any part of the **maxilla**, but they rarely arise from its facial surface, and, though fairly frequent on the gums, are very rare in connection with the mucous membrane of the palatine process. The muco-periosteum of the **antrum** is a common situation for these tumours, and as they grow lead to thinning and expansion of the walls of this chamber. This enlargement of the body of the maxilla causes it to encroach on the nasal fossa and obstruct respiration: often the tumour pushes up the orbital plate and displaces the eyeball (proptosis) and in a certain proportion of cases the alveolar border is depressed. The nasal duct is frequently implicated, and when completely obstructed epiphora is the consequence. Clinically, a sarcoma originating within the antrum behaves like a central tumour in a long bone, and by degrees processes of the tumour make their way through the thin walls and implicate the skin of the cheek, or, projecting into the nasal fossa, ulcerate, and give rise to frequently recurring hæmorrhage. When the tumour makes its way through the posterior wall of the antrum it will enter the zygomatic and spheno-maxillary fossæ, and creep thence into the temporal fossa, or make its way through the spheno-maxillary fissure and ramify in the orbit, or steal through the sphenoidal fissure or foramen rotundum into the middle fossa of the cranium.

Sarcomata growing from the **gums** project usually into the space between the teeth and the cheeks; such tumours, when large, stretch the cheeks and often produce great displacement of the teeth on the affected side, and marked alterations in the conformation of the alveolar borders of the jaws. When the tumour is unusually large it will protrude beyond the lips.

Periosteal sarcomata of the jaws are very rare before the

age of fifteen years, but they occasionally happen in very young children. The usual period of life at which they grow is between the twentieth and sixtieth years.

Periosteal sarcomata are less frequent on the mandible than the maxilla; they may grow from any part of it, and sometimes attain a large size. The spindle-celled species is very apt to contain cartilage, and this tissue may be very abundant. Sarcomata springing from the outer surface of the ramus are apt to be mistaken for parotid tumours.

Myeloid Sarcomata are very rare in the **maxilla**, and, as a rule, arise in connection with the nasal process; although they grow slowly, such tumours sometimes attain a large size. In the mandible they spring usually from the body of the bone.

To judge from the descriptions current in text-books, it would be imagined that myeloid sarcomata are fairly frequent in the alveolar borders of the jaws; this error is due to the circumstance that sufficient attention has not been devoted to sarcomata arising in connection with developing teeth. When specimens preserved in museums as examples of myeloid sarcomata of jaws are critically examined they will be found to fall into three categories:—1, Fibrous odontomes; 2, sarcomata originating in the follicles of teeth; 3, myeloid sarcomata.

Fibrous odontomes have already been considered, and the presence of the few multinucleated cells they contain explained. (Page 34.)

Sarcomata arising in the **follicles of teeth** are composed of small round, and spindle cells, with a few multinuclear cells interspersed. In their early stages these tumours are distinctly encapsuled, but as they increase in size and involve the gums, the exposed surfaces ulcerate, and give rise to hæmorrhage. When ulceration occurs, the neighbouring lymph glands are apt to become infected.

Sarcoma of a tooth follicle only occurs in children, and is particularly apt to involve the germ of the first permanent molar. (Fig. 56.)

When suspected cases are critically examined, myeloid sarcomata of the jaws, as in other parts of the skeleton, will be found somewhat unusual tumours. They are rarely met with

after the twenty-fifth year, and in the jaws, as elsewhere, are the least malignant species of sarcomata.

It has been mentioned that the maxilla is very apt to become involved by sarcomata springing from adjacent parts, and this is a very important clinical fact to bear in mind. This invasion may take place from two sources; in particular, the naso-pharynx and nasal fossa.

Spindle-celled sarcomata occasionally arise in that portion of the pharyngeal mucous membrane which covers the under surface of the body of the sphenoid and forms the roof of the naso-pharynx. It is not uncommon for such tumours to

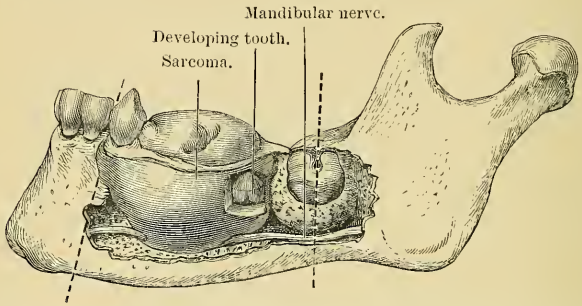

Fig. 56.—Sarcoma arising in the follicle of a developing tooth. (The dotted lines indicate the amount of the mandible removed at the operation.)

extend into and plug one or both nasal fossæ, processes of the tumour appearing at the nostril; or they may extend downwards into the pharynx and impede deglutition. Sometimes the base of the skull is perforated by the tumour, and the patient dies of meningitis. Naso-pharyngeal sarcomata give rise to agonising pain and intense frontal headache. Whilst the pain wears out the patient, strength is further exhausted by frequently recurring and often profuse epistaxis. Exceptionally, a piece of the tumour will slough and become impacted in the larynx; suffocation has followed this accident. Naso-pharyngeal sarcomata are chiefly met with in patients between the age of fifteen and twenty.

Sarcomata arising in the nasal fossa and invading the antrum are not very common. One of the most remarkable cases illustrating this has been recorded by Moore.* In this

* Trans. Path. Soc., vol. xix. 332.

instance a mixed-celled sarcoma arose in connection with the nasal septum and spread laterally into each antrum. As it increased in size the space between the orbits widened, and at the same time the face projected forwards, producing the dreadful deformity depicted in Fig. 57. One of the most extraordinary features in this unusual case was the entire absence of pain or cerebral disturbance; the sense of smell was lost and the sight of the right eye impaired. Moore attempted the formidable

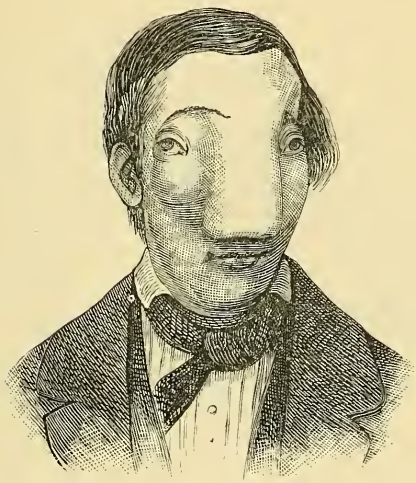

Fig. 57.—Deformity produced by a sarcoma of the nasal septum. (*Moore's case.*)

task of removing this tumour, but the patient died during its progress, in consequence of some interference with respiration.

An examination of the parts showed that the tumour was surrounded by a thick osseous capsule, its wall being continuous with that portion of the nasal septum formed by the mesethmoid (Fig. 58); as the tumour increased in size it invaded each antrum, but its bony capsule remained separate from the maxillæ.

Sarcomata of the Retina.—These tumours are often called gliomata; formerly they were known as medullary cancer, encephaloid tumours, or fungus hæmatodes.

A retinal sarcoma, in structure, mimics the cells composing the granular layer of the retina. It occurs exclusively in children. Exceptionally the tumour may be noticed at birth;

more commonly it makes its appearance during the first four years of life ; it is very rare after the seventh year, and is almost unknown after the age of twelve. In a certain proportion of cases (twenty per cent.)* both retinæ are affected, either simultaneously or after a brief interval. This is always an indication that the tumour is highly malignant. In the early stages there is, as a rule, no pain or symptom denoting the presence of a tumour ; gradually the pupil dilates, and a pecu-

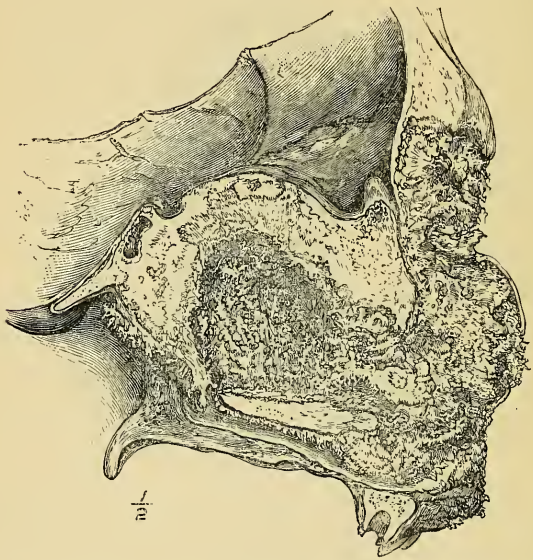

Fig. 58.—Facial region of the skull from the case shown in the preceding figure, seen in sagittal section. The sarcoma is restricted to the nasal septum. (*Museum, Middlesex Hospital.*)

liar reflex is noticed at the fundus (this is often termed cat's-eye), and, on testing, the eye will be found quite blind. As soon as the existence of a glioma is discovered by the surgeon, the eye is, as a rule, promptly excised. In cases where treatment of this kind is refused or deferred, the following changes occur. The tumour, continuing to increase, pushes forward the intra-ocular structures and induces great pain as the result of the increased intra-ocular pressure it produces, until the cornea yields and the tumour bursts forth, and, growing very rapidly, soon makes its way between the eyelids, which become swollen

* Lawford and Collins, Roy. Lond. Ophth. Hosp. Rep., vol. xiii., p. 1.

and everted, and then, in consequence of exposure, assumes a dusky red fleshy appearance, whilst from its surface a sanious fluid exudes which may form crusts on the surface of the tumour. Should the parts become excoriated or handled, they bleed freely. A fungating tumour of this kind will sometimes attain a very large size before it destroys the child's life.

After excision of an eye for retinal sarcoma the disease is very prone to recur, and the recurrent tumour may attain very large proportions before it destroys life. There is a specimen in the museum of the Middlesex Hospital which well illustrates the malignant characters of some retinal sarcomata. The patient, a girl two years of age, had a tumour in each eye. In December, 1883, Mr. G. Lawson * excised the right eye; in January, 1884, the left was removed on account of the pain caused by the tumour. A month later the sarcoma recurred in the left orbit, and grew so rapidly that in August there was a large tumour extending over the left half of the child's face like a huge cauliflower. She died eight months after the removal of the right eye. Secondary deposits were found in the right deltoid, on the dura mater, and a mass as large as an orange was connected with the optic commissure and occupied the sella turcica.

The disease in this case was exceptional in the rapidity of its growth, the large size to which the recurrent tumour attained, and the presence of secondary deposits, which are the exception rather than the rule. When an eye is excised for retinal sarcoma, and especially when the operation has been long delayed, the growth may have burst through the sclerotic and invaded the orbital tissues; in a larger proportion of cases it has infiltrated the optic nerve, and it is in this structure that the disease reappears. The frequency with which sarcoma returns in the stump of the optic nerve is, in all probability, due to the intimate lymphatic relations of this nerve with the intra-ocular lymph spaces.

* Trans. Path. Soc., vol. xxxvi., 418.

CHAPTER X.

SARCOMATA (*continued*).

Sarcomata of Secreting Glands.—In describing spindle-celled sarcomata it was mentioned that it is no uncommon condition to find tracts of hyaline cartilage, usually of an immature type, in the substance of the tumour. When the cartilage is fairly abundant, the tumour is usually described as a chondrifying sarcoma. In addition to bone, tumours of this character occur in the parotid, submaxillary, and lachrymal glands; in the testis and in the mamma. In the case of the salivary glands and the testis the cartilage often constitutes the main mass of the tumour, which is, under such conditions, erroneously described as a chondroma.

1. **Parotid Sarcomata.**—These appear as oval, smooth, and elastic swellings in the parotid immediately in front of or behind the angle of the mandible; increasing in size, they become tuberous and may implicate the tragus. Left to themselves, they burrow deeply among the tissues of the neck, dip beneath the sterno-mastoid, and acquire attachments to the carotid sheath; sometimes they creep upwards and adhere to the under surface of the petrosal, and pushing towards the middle line, so bulge the pharyngeal wall inwards as to impede deglutition. Rapidly growing tumours tend to involve the skin and ulcerate; in very large tumours semi-fluctuating spaces form in consequence of degenerate (mucoid) changes.

The facial nerve is usually involved in large parotid tumours; the small specimens which burrow behind the ramus of the mandible often implicate the nerve as it issues from the stylo-mastoid foramen.

Structurally, these tumours exhibit extraordinary variety. Some consist entirely of hyaline cartilage arranged in lobules bound together by loose connective tissue. The cells of the cartilage rarely possess capsules, and are often stellate, as in immature cartilage. Such grow with extreme slowness, and rarely exceed a bantam's egg in size, and may require ten or even twelve years to attain such proportions.

The large, rapidly growing tumours consist of spindle cells

in which tracts and islets of hyaline cartilage are interspersed. When chondral tissue is abundant, it is very prone to mucoid changes, and soft, fluctuating spaces are formed. The connective tissue is very liable to undergo myxomatous change, and, as if to render these tumours more complex, portions of the secreting tissue of the gland are imprisoned in them.

It is not unusual in sections from a parotid sarcoma to meet with spindle cells, cartilage, myxomatous tissue, glandular

Fig. 59.—Parotid sarcoma implicating the pinna in a woman thirty-five years of age.

acini, and fibrous tissue in an area 2 cm. square. Exceptionally striped spindle cells are seen. Parotid tumours of such complex structure grow rapidly and attain a large size, and often infiltrate the surrounding tissue and skin. Some of them infect the adjacent lymph glands and give rise to secondary deposits in the lungs.

Chondrifying sarcomata of the parotid are most frequently met with between the fifteenth and thirty-fifth years, but they have been observed as late as the seventy-fourth year. They present very characteristic features. (Fig. 59.) In their early stages they are easily removed, but many of the rapidly

growing forms so quickly infiltrate the tissues that their complete extirpation is not always possible.

When left to themselves they cause death in a variety of ways. Thus they may press upon the pharynx and lead to fatal dysphagia, or ulceration may open some large vessel in the neck and produce fatal hæmorrhage; secondary nodules sometimes form in the lungs and induce fatal broncho-pneumonia.

2. **Chondrifying Sarcomata of the Submaxillary Gland.**—These tumours are far less frequent in the submaxillary than in the parotid gland. They are distinctly encapsuled and, as a rule, shell out easily. They grow slowly and occur in the young as well as in adults, but they do not appear to attain so large a size as in the case of the parotid. Butlin* has described a typical case, and gives references to a few other examples. As in the case of parotid sarcomata, glandular tissue is often associated with the cartilage.

3. **Chondrifying Sarcomata of the Lachrymal Gland.**—Tumours containing cartilage are very rare in this gland. Butlin† has described an example removed by Vernon from the orbit of a man twenty-eight years of age. The tumour had been growing nine years; it was easily shelled out of a tough capsule, and measured 6 by 4 cm. Seven years later the man was free from recurrence.

4. **Sarcomata of the Pancreas.** — Connective-tissue tumours of the pancreas are very rare. I have not succeeded in finding a specimen or description of a chondrifying sarcoma of the pancreas.

Sarcomata of the Testicle.—This gland is somewhat prone to sarcomata; the two varieties, round-celled and spindle-celled, occur in about equal proportion. Lympho-sarcomata occur occasionally. Butlin‡ has pointed out that the disease is most frequent at two periods of life: the first period begins at birth and ends with the tenth year; the second period is from the thirtieth to the fortieth years.

It is not rare to find both testes affected in cases of round-

* Trans. Path. Soc., vol. xxviii. 228. (*See also* Lane, Trans. Clin. Soc., vol. xxiv., 17).

† Trans. Path. Soc., vol. xxvi., 184.

‡ "Sarcoma and Carcinoma," London.

celled sarcomata, and in this respect there is an interesting analogy between this species of sarcoma in the testis, ovary, and retina.

Spindle-celled sarcoma of the testis only attacks one testicle; in about one-half the cases the tumours contain hyaline cartilage, and in some the amount of cartilage is so large that they have been described as "enchondromata" of the testis.

Occasionally the cartilage assumes the form of tubes or cylinders disposed like the tubules of the testis. One of the best examples is the classical case described by Sir James Paget.* The secondary deposits associated with chondrifying testicular sarcomata contain cartilage, and in a few instances this tissue is more abundant in the secondary nodules than in the primary tumour. Spindle cells with transverse striation occasionally occur.

Spindle-celled sarcomata of the testis in their structure and life history are parallel with parotid sarcomata, and, like these tumours, are occasionally composed almost entirely of cartilage. Butlin has described a case in which castration was performed in 1875 on a man, twenty-one years of age, for a small tumour of the testis which had been growing four years. It was composed of hyaline cartilage with a capsule of fibrous tissue, and septa of the same tissue traversed the cartilage. The man was in good health in 1879.

Lympho-sarcomata of the testis are often included in the round-celled species; this is unfortunate, as the lympho-sarcomata are even more malignant than the round-celled tumours, and disseminate much more rapidly. It is also well established that they not infrequently attack both testes either simultaneously or after a brief interval.

The clinical recognition of sarcoma of the testis is not by any means a simple matter; it is often impossible to distinguish between a hæmatocele and a solid tumour. The points on which it is best to rely are the weight of the tumour and absence of inflammation, syphilis, and translucency. Some sarcomata are intensely hard, others are soft and almost fluctuate; most of them are painless, but a few are the seat of continual pain.

* Med. Chir. Trans., vol. xxxviii. 247.

Ovarian Sarcomata.—The ovary is occasionally the seat of sarcoma; the round- and spindle-celled species occur in about equal proportion. Both ovaries are simultaneously affected in about twenty per cent. of the cases; in this respect sarcomata of the ovaries resemble those of the testis and retina. The similarity of ovarian and retinal sarcomata is further illustrated by the fact that they are most frequent in young children. For instance, in seventy recorded cases of ovarian cysts and tumours removed from girls under fifteen years of age, twelve were examples of sarcomata. In comprehensive ovariotomy lists solid tumours make up five per cent. of the cases, and this includes fibromata and myomata, as well as sarcomata, occurring at all periods of life. A careful study of cases shows that sarcomata of the ovaries are four times more frequent in girls under fifteen years of age than in adult women.

At whatever period of life they appear, ovarian sarcomata grow rapidly, and are invariably associated with free fluid in the peritoneum; in the later stages of the disease fluid accumulations may occur in one or both pleural cavities.

Ovarian sarcoma in the young and in adults runs a rapidly fatal course.

Sarcomata of the Mammary Gland.—The mamma is occasionally the seat of a sarcoma, and when we take into consideration the large amount of connective tissue which it often contains, it is somewhat surprising that these tumours are not more frequent. As is the case with sarcomata growing in the parotid gland, these tumours, originating in the connective tissue of the breast, usually entangle the ducts and acini in their immediate neighbourhood; such incorporated glandular structures occasionally give rise to cystic spaces, which, when viewed in section under the microscope, exhibit a regular lining of epithelium. Such tumours are often called "adenosarcomata." This is a misuse of the term sarcoma, and it has unfortunately been extended so as to include many adenomata of the breast, especially if they should happen to grow rapidly or attain a large size.

The breast is liable to round- and spindle-celled sarcomata. The round-celled species rapidly infiltrate the organ and invade adjacent structures, giving rise to brawny indurated

tumours. They recur very quickly after removal, and grow with fearful rapidity in women who are suckling.

Spindle-celled sarcomata grow slowly, and in the few reported cases the tumour had attained the proportion of an orange before removal. In the breast, as in the case of the salivary glands and testis, such tumours occasionally contain tracts of hyaline cartilage* and even well-formed bone.†

* Bowlby, Trans. Path. Soc., vol. xxxiii. 306.
† Battle, Trans. Path. Soc., vol. xxxvii. 473.

CHAPTER XI.

SARCOMATA (*continued*).

Myo-sarcomata (RHABDOMYOMATA).—It is a remarkable fact, considering the large amount of striped muscle tissue existing in the body, that tumours composed of, or containing, this tissue do not arise in connection with the voluntary muscles, but make their appearance in such unexpected situations as the kidney, testis, neck of the uterus, parotid gland, and in parosteal lipomata, organs and tissues which, under normal conditions, do not contain muscle cells of the striped variety.

Before discussing the probable origin of striped muscle cells in anomalous situations, it will be necessary to consider the characters of the tumours in which they occur, for more extended observations have brought to light many facts which serve materially to modify the earlier speculations on this question.

1. **Renal Sarcomata.**—The following species of sarcomata occur in the kidney:—(1) Spindle-celled sarcoma and its variety, myo-sarcoma; (2) Round-celled sarcoma; (3) Tumours composed of adrenal tissue.

The most remarkable feature concerning renal sarcomata is that in a very large proportion of cases they are congenital, or are noticed within a few months of birth.

Congenital Renal Sarcomata exhibit the following characters. These tumours grow very rapidly and attain large dimensions in the course of a few months; they are, as a rule, painless. Death, which usually occurs before the end of the third year, is, in most cases, due to mechanical causes; the large size of the tumour causes it to push up the diaphragm, encroach upon the thoracic cavity, and impede respiration.

In about half the cases both kidneys are affected; when only a portion of the gland is involved the tumour is isolated from the renal tissue by a capsule. On section the sarcoma presents a yellowish-white colour, dotted here and there with groups of small cavities due to secondary changes. The basis of the tumour is connective tissue containing cells of various

shapes and sizes; some are round or oat-shaped, and others are spindles. In many specimens a large proportion of the tumour is composed of fasciculi, which present the cross striation so characteristic of the fibres of voluntary muscle; when these cells are isolated they appear as elongated spindles furnished with a large nucleus and transversely striated; in some of them there is also an oblique striation. The cells are without a sarcolemma.

The second variety of renal sarcoma has been called "congenital adeno-sarcoma" (a very misleading name) because it contains groups of tubules lined with regular cubical epithelium, so that on section they convey an appearance like that afforded by a number of renal tubules in transverse section. An examination of several examples of these tumours and a careful study of the descriptions published by others, make it appear that when the striped cells are very abundant the epithelial-lined tubules are, as a rule, absent, and when the tubules are numerous it may be necessary to examine many sections before the striated cells are detected. In the two conditions the round, oat-shaped, and spindle cells are equally abundant.

It has been suggested by Paul that, as the most typical myo-sarcomata are more sharply delimited from the kidney than the other varieties, the tubular elements may be derived from the kidney; my own inquiries do not support this view. Renal myo-sarcomata are well supplied with blood-vessels, and do not, as a rule, give rise to secondary deposits.

Ribbert, in an interesting paper, has collected the scattered literature relating to these tumours, and enriched it by some new observations. He refers to two cases described in "Dissertations at Bonn, 1891," in which tumours containing striated spindles occupied the pelvis of the kidney. One case was obtained from an adult man, the other from a child eight years and a half old.

Renal sarcomata of the round- and spindle-celled species occur in adults; they are less common than in infants, and differ from them in two important points:—

(1) It is rare for both kidneys to be affected.

(2) Striated cells are very rarely present.

They may occur at any age, but an examination of a large

number of records indicates that the period between the fifth and thirtieth years of life is singularly free from renal sarcomata. They seem to occur equally in men and women. The effects which they produce are similar to those of sarcomata in other organs. Occasionally a process of the tumour will make its way into the pelvis of the kidney and travel down the ureter in the same manner that sarcomatous out-runners make their way along the lumina of veins whenever they manage to penetrate the walls of these vessels. (*See* page 74.) When the ureter is thus invaded small fragments of the tumour are detached and conveyed by the urine into the bladder, to be expelled during micturition. This fact is worth remembering, as it is sometimes of assistance in diagnosis.

It is necessary to mention that a ureter may be involved in a sarcoma arising in its neighbourhood; the walls become infiltrated, and then a process of the tumour may project into its lumen. Exceptionally, a process from a sarcoma of the bladder will enter the vesical orifice of the ureter and travel along it for a considerable distance.

Much uncertainty must exist in drawing conclusions from old records of renal sarcomata, because it is now clear that many tumours of the kidney in adults, which have been described as sarcomata, were, in many instances, composed of tissue similar, if not identical, in structure with that which forms the zona fasciculata of the adrenal (suprarenal capsule). (Fig. 60.) It is quite certain that some specimens regarded as sarcomata of the kidney turn out on critical investigation to be tumours of the adrenals; it will therefore be necessary to consider tumours of the adrenal as a sequel to renal sarcomata.

Adrenal Tumours.—There are two varieties of tumour which come under this heading:—(1) Tumours of the adrenal. (2) Tumours of accessory adrenals.

There is sufficient evidence forthcoming to demonstrate that an adrenal may become transformed into a large tumour in the same way that the thyroid gland becomes a goitre; indeed, the analogy is so striking that Virchow, years ago, proposed for such enlarged adrenals the term "struma suprarenalis." The museum of the Royal College of Surgeons contains two good specimens of enlarged adrenals, one of which

weighed eleven pounds.* They were removed from patients aged fifty-three and thirty-six years respectively.

Similar tumours (adrenal goitres) also occur in other mammals. In 1885 I detected in a marmot (*Cynomys ludo-*

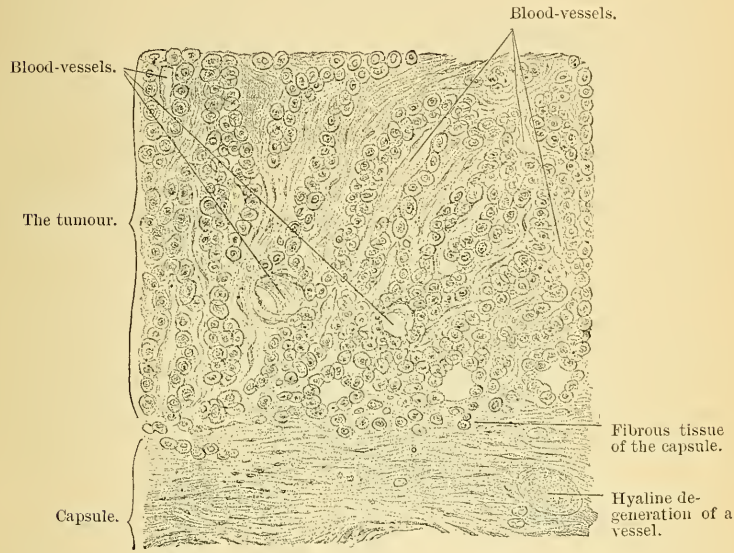

Fig. 60.—Microscopical characters of a tumour arising in an accessory adrenal. (*Grawitz.*)

vicianus) an example associated with numerous secondary nodules in the liver and one in the spleen.†

It is well known that accessory adrenals are fairly common, and have, in many instances, been detected embedded in the cortex of the kidney beneath its capsule. These bodies contain a quantity of fat, and this fact has led many writers to describe them as "renal lipomata." When sections of these supposed fatty tumours are submitted to ether and the fat dissolved from them, their structural identity with an adrenal is obvious enough. Ordinarily, these accessory adrenals are no larger than a cherry-stone, but now and then they become large and dangerous tumours, and by pressure induce

* Thornton, Trans. Path. Soc., vol. xxxiv. 141, and Trans. Clin. Soc., vol. xxiii. 150.

† *Journal of Anat. and Phys.*, vol. xix., p. 458, pl. xxiii., fig. 7.

destruction of the kidney. An excellent example is represented in Fig. 61, which was removed from a man forty-three years of age. Many secondary nodules were observed, during

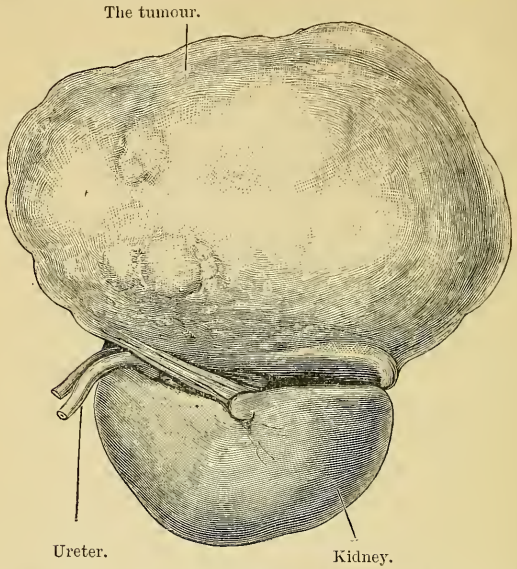

Fig. 61.—Renal tumour originating in an accessory adrenal. (*After Henry Morris.**)

the operation, in the liver. There was also a fixed hard nodule in the left temporal region.

Mr. Morris† in his account of this interesting case, draws attention to the analogy of this kind of tumour with the rare form of goitre which is accompanied by secondary deposits in the bone and viscera, these deposits being structural reproductions of the thyroid gland. (*See* page 243.)

Clinical Features.—In describing the various kinds of renal sarcomata, incidental references have been made to most of their clinical peculiarities. Sarcomata of the kidneys in infants are so well known that their clinical recognition is a very simple matter.

As a rule, the diagnosis of solid renal tumours is not a matter of difficulty, but at present there is no way of distinguishing between a renal sarcoma and a tumour arising in

* Grawitz, Virchow's "Archiv," xciii., 39.

† *Brit. Med. Journal*, 1893, vol. i., p. 2.

an accessory adrenal. It is also difficult to decide between a solid renal tumour and one arising in an adrenal. Clinical observation may soon render this probable, for it has been noticed in at least two cases (Thornton) that in tumours of the adrenal there is an absence of hæmaturia, whereas in all cases of solid tumours of the kidney in adults, whether sarcomata or arising in accessory adrenals lodged in its cortex, from time to time the urine will be found to contain blood,—sometimes mere traces, but occasionally it will be abundant.

Sarcoma of the kidney in children and in adults runs a rapidly fatal course. In children the duration of life, after the tumour has attained such a size as to be obvious clinically, is rarely longer than six months. In adults life is seldom prolonged beyond eighteen months. The malignancy of renal sarcomata is displayed in the tables on pages 120 and 121.

2. **Myo-sarcomata of the Testis.**—Tumours composed mainly of spindle cells exhibiting cross striation have several times been found in connection with the testis. One of the earliest and most carefully described cases is that of Neumann*

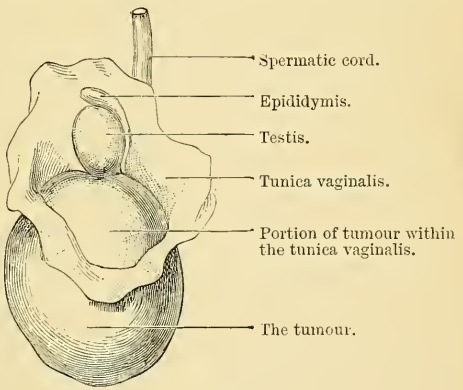

Fig. 62.—Myo-sarcoma of the testis. (*After Neumann.*)

(Fig. 62), in which a myoma was situated at the lower pole of the testis of a child three and a half years old.

Ribbert† refers to three specimens; of these two were

* Virchow's "Archiv," bd. ciii. 497.

† Virchow's "Archiv," bd. cxxx. 249. This paper contains a complete list of references.

removed from children aged thirteen and fourteen years respectively; the age of the third patient is not stated.

3. **Myo-sarcomata of the Uterus and Vagina.**—Tumours containing striped muscle fibre have been found in connection with the body of the uterus, neck of the uterus, and vagina. One of the most remarkable as well as one of the best described cases is recorded by Pernice.* In this instance a racemose tumour grew from the cervix uteri of a woman. This tumour, when examined microscopically, was found to contain a large number of spindle-shaped cells, which were nucleated, and exhibited a transverse striation such as exists in myo-sarcomata. (Fig. 50.) In the basal parts of this tumour gland-like spaces lined with cylindrical or with cubical epithelium were found.

After removal the tumour quickly recurred; it was removed a second time, but reappeared, rapidly infiltrated the uterus, forming a large mass; death speedily ensued.

When the recurrent tumours were microscoped no striated spindles were found, and the growth had all the characters of a spindle-celled sarcoma.

4. **Myo-sarcoma of the Parotid Gland.**—Prudden† has described a tumour situated near the angle of the mandible of a boy seven years old. The tumour contained, in addition to round and spindle cells, numerous striated spindles and tubules lined with cubical epithelium. Its resemblance to a renal myo-sarcoma was thus very close.

5. **Myo-sarcomata of Periosteum.**—Zenker‡ and Bayer have each met with an example in the orbit; Targett § found one on the scapula of a child six months old; and Marchand ‖ describes one which grew from the ischial tuberosity of a boy four years of age. It is also singular that congenital lipomata growing from periosteum contain striped muscle fibre. These have already been described (page 13).

There has been much speculation as to the mode of origin of myo-sarcomata. When our knowledge of them was limited to those which occurred in the kidney, the notion that they

* Virchow's "Archiv," bd. cxiii. 46.
† *Am. Jour. Med. Sci.*, 1883.
‡ Virchow's "Archiv," bd. cxx.
§ Trans. Path. Soc., vol. xliii. 157.
‖ Virchow's "Archiv," bd. c. p. 42.

arose in detached portions of the mesoblastic somites, as suggested by Cohnheim, found favour with many; striped cells in tumours of the testis were explained as arising from the muscular tissue of the gubernaculum. Increased observations show that these notions are untenable. It is much more reasonable to regard the presence of striated cells in sarcomata as due to the similar changes in the tissue that give rise to hyaline cartilage. Muscle belongs to the connective tissues, and is derived from the same tissue as that which furnishes cartilage and fat. It is also of interest in relation to the frequency with which chondro-sarcomata arise from periosteum, that myo-sarcomata also spring from this membrane.

CHAPTER XII.

SARCOMATA (*continued*).

Lympho-sarcoma.—This species is, by many writers, regarded as a variety of the round-celled sarcoma. As lympho-sarcomata exhibit a very characteristic structure, and occur, as a rule, in very definite situations, and have somewhat special clinical features, it is desirable to separate them from the round-celled species. These tumours occur in the superior mediastinum, in the subpleural and subperitoneal connective tissue, at the base of the tongue, in the larynx, in the tonsil, and in the testis.

In considering these tumours, the overgrowth of lymphoid tissue in lymph glands will not be dealt with; an enlarged lymph gland, a big liver, a leukæmic spleen, or a parenchymatous goitre, are not tumours in the sense in which the term is employed in this book.

1. **Thoracic Lympho-sarcomata.** — The most frequent situation for a lympho-sarcoma is the posterior mediastinum; it probably starts in connection with a lymphatic gland, and, growing rapidly, quickly envelops the trachea and bronchi, the aorta and other large vessels, the œsophagus, and large nerve trunks. The tumour extends along the branches of the bronchi and invades the interlobular connective tissue at the roots of the lungs. When the tumour starts in the superior mediastinum it descends along the big vessels and invests the pericardium. It may even creep along the sheaths of the vessels to the heart and infiltrate its substance: this is rare. Processes of the tumour may find their way along the sheaths of the big vessels and appear in the posterior triangles of the neck.

The relation of a mediastinal lympho-sarcoma to the adjacent structures is interesting. For instance, the large arterial trunks, though embedded in the tumour, are not as a rule damaged by it; the thin-walled veins are early compressed, and interference with the venous circulation is a marked feature. In some of the cases infiltration of the walls of the veins takes place, and processes of the tumour project into their channels.

The bronchi are very liable to be damaged by a lympho-sarcoma, for the tumour moulds itself around these tubes, and by pressure causes them to be narrowed; apart from this effect, the tissues proper of the tubes become eroded as well as atrophied. These changes not only induce difficulty in respiration by restricting the admission of air, but the compression of the vessels accompanying the bronchi leads to changes in the nutrition of the pulmonary tissue, which end in pneumonia, gangrene, and death.

The important nerves traversing the mediastinum, the vagus and phrenic nerves especially, are often involved in the

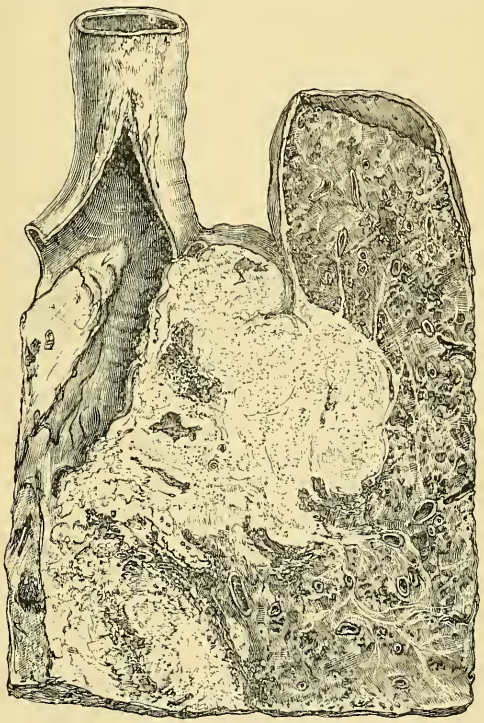

Fig. 63.—Portion of a mediastinal lympho-sarcoma, to show the manner in which the tumour extends along the bronchi and pulmonary vessels.

tumour, but their sheaths are rarely invaded by the cells; in some instances the left recurrent laryngeal nerve is compressed sufficiently to produce severe laryngeal spasms and even paralysis of the muscles supplied by it.

The œsophagus becomes compressed by an intrathoracic lympho-sarcoma, but dysphagia is not so prominent a symptom as in many cases of intrathoracic aneurysm.

It is a somewhat remarkable feature of lympho-sarcomata that they extend to, and enclose, neighbouring lymph glands without affecting them. For instance, it is not unusual, in a section of a large mediastinal lympho-sarcoma, to find bronchial lymph glands, fully charged with pigment, exposed on the cut surface of the tumour and embedded in its substance. (Fig. 63.)

2. **Abdominal Lympho-sarcomata** occasionally arise in the connective-tissue planes posterior to the peritoneum; in this situation the tumour involves the abdominal aorta, and is conducted to the kidney by the renal vessels. A lympho-sarcoma sometimes arises in the perirenal tissue and forms large lobulated masses enveloping the kidney. My own observations indicate that abdominal lympho-sarcomata are more common in children than adults.

Lympho-sarcomata sometimes arise in the connective tissue between the pelvic peritoneum and the pelvic fascia, and form large lobulated masses, which are apt to involve the rectum. In such cases large secondary deposits are formed in the liver.

3. **Lingual and Laryngeal Lympho-sarcomata.**—Between the mouth and the true pharynx there exists a somewhat remarkable ring of lymphoid tissue which is worth some consideration. The lateral portions of this ring are indicated by the tonsils; the superior segment is formed by the collection of adenoid tissue on the posterior wall of the pharynx near the roof, known as the pharyngeal tonsil, and the inferior segment consists of a collection of this tissue on the posterior third of the tongue, sometimes referred to as the lingual tonsil; extensions from it run downwards into the mucous membrane of the larynx. This circle of lymphoid tissue is the source of lingual and laryngeal lympho-sarcomata.

Lingual Lympho-sarcomata.—One of the best observed cases is recorded by Hutchinson.* The patient was a man twenty-two years of age. The tumour, which had been growing half the patient's life, at last attained such a size as to interfere with respiration and deglutition. The tongue and

* Med.-Chir. Trans., lviii. 311.

tumour were removed. The mucous membrane covering it was nodulated like a mulberry. Two years later there was a recurrence, and the patient died quickly, partly from pressure and partly from exhaustion.

Laryngeal Lympho-sarcomata are very rare tumours, and usually take the form of outgrowths from the laryngeal mucous membrane.* Beale† recorded fully a case associated with secondary nodules in the eyelid and cerebral membranes.

4. **Testicular lympho-sarcomata** are well-known tumours, and their occurrence in this organ cannot easily be explained. Many of these tumours are described as small round-celled sarcomata. The chief facts to relate concerning them is that they occur in lads and young adults, often affect first one and then the other testicle after a variable interval, disseminate very rapidly, and speedily cause death.

An instructive case of lympho-sarcoma affecting one testicle and subsequently its fellow is described by Hutchinson.‡ It is well worth perusal: the patient was seventy years of age.

* Wolfenden and Martin, "Studies in Path. Anat.," 1888, p. 26.

† *Lancet*, 1887, vol. ii. 749.

‡ Trans. Path. Soc., vol. xl., 193.

CHAPTER XIII.

SARCOMATA (*continued*).

Melanosis and Melano-sarcoma.—In the majority of mammals there are certain epithelial and fibrous tissues which normally contain pigment. Among pigmented tissues the skin and epithelial layer of the retina hold the first place. In skin the pigment is chiefly contained in the deeper layers of the rete mucosum; hence hair that is derived from the cells of this layer is pigmented also. In many mammals other tissues contain pigment, such as the mucous membrane of the roof of the mouth of the dog, and the blue colouration of the vaginal mucous membrane of the vervet monkey.

In man the amount of pigment in the skin varies greatly, so that we may pass gradually from individuals whose skins are intensely black to others who have no trace of cutaneous pigment.

It is a noteworthy fact that animals with no pigment in the skin also lack pigment in the uveal tract of the eyeball. A familiar example of this is the white rabbit with pink eyes. Such a condition is termed *albinism*, and colourless animals, or *albinos*, occur among all classes of animals, vertebrate and invertebrate. Excessive development of black pigment in the skin is known as *melanism*; this is much rarer than albinism.

Abnormal distribution of pigment is common; in man it gives rise to the condition termed leucoderma when it affects the skin, and unequal distribution of pigment in the retina is known as retinitis pigmentosa. Irregular patches of black in the skins of horses cause them to be described as piebald, and when disseminated in small dots and irregular tracts they are said to be grey.

In the white races of men the pigment granules are almost entirely confined to the cells of the rete mucosum, but when the pigmentation is very marked it will be found distributed in the other tissues of the skin. The pigment, or melanin as it is called, lies within the cells either in the form of black or brown granules, or they may be uniformly

stained by it. As to the source of the pigment nothing is known.

Melanosis is sometimes produced by parasites. This variety of melanism is rarely seen in man, but is fairly frequent in other animals. An example is depicted in Fig. 64.

Pigmentation in this form is not uncommon in the lungs of mammals, but it must not be confounded with the

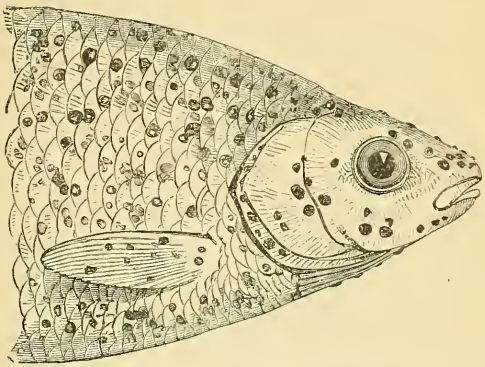

Fig. 64.—Anterior portion of a dace ; each black spot contains a central white dot representing an encysted parasite.

irregular black patches so common in the lungs of those who dwell in densely populated and smoky towns. Small nodules surrounded by a zone of intensely black pigment are not uncommon in the skins of dogs ; the central nodules usually contain an encysted parasite.

Pathological pigmentation in its most serious forms is found in connection with tumours arising in the skin or within the eyeball. Melanotic tumours occur in two genera :—

1. Melano-sarcoma.
2. Melano-carcinoma.

1. **Melano-sarcomata**.—It was formerly the custom to describe all varieties of melanotic tumours as cancers. Later, when the histological distinctions between sarcoma and cancer were more accurately defined, it was found that the majority of tumours containing black pigment were structurally sarcomata. Recent careful researches, of which some details will be given afterwards, establish beyond any doubt that some melanomata are cancers.

In these tumours, whether sarcomata or cancers, the amount of pigment varies greatly; in some it is so little that the tumours on section present merely a brown colouration, whilst in others it may be so abundant that they are of the deepest black. The pigment particles are lodged in and among not only the characteristic cells of the tumour, but in and among those of its fibrous matrix, and even in the walls of its vessels. It is also worth mention that the primary tumour may contain very slight traces of pigment, sometimes so slight as even to raise a doubt whether it should be called melanotic; yet the secondary growths and the lymph glands infected by it will be of an inky-black colour. The intense blackness of the secondary deposits leads to their ready recognition, and doubtless accounts for the belief that this species becomes more widely disseminated than other malignant tumours; but an equally wide distribution of secondary nodules in unpigmented tumours will sometimes be found when the organs are submitted to a rigorous search.

Primary Melano-sarcomata of the Skin.—Two varieties of melano-sarcoma occur in the skin. The most frequent has its origin in pigmented moles (Fig. 65); the rarer variety arises in, or near, the matrix of the nail of a finger or toe.

Melano-sarcomata occurring in moles differ from other melanomata in that the cells are collected in alveoli. It is pointed out in the chapter on moles that the tissue forming the base of a mole, as a rule, presents an alveolar disposition; this structural peculiarity comes out very strongly when a mole is the seat of a melanoma.

A pigmented mole may remain quiescent throughout a very long life and never cause the least inconvenience; in other instances, fortunately rare, as life advances the mole ulcerates, perhaps bleeds freely, and may even become partially healed; but coincident with the onset of ulceration the adjacent lymph glands enlarge, become charged with pigment and sarcomatous tissue, spaces filled with inky fluid form in them, and finally the overlying skin ulcerates. The infection may not proceed further than this; recurrent hæmorrhages from the fungating glands or a furious bleeding, should a large vein or artery become broached by ulceration, carries off the patient. In many cases the morbid material is disseminated

into distant parts, secondary knots form in the liver, lung, kidney, or brain, and death arises from interference with the functions of these organs.

In other cases the mole, instead of ulcerating, is observed

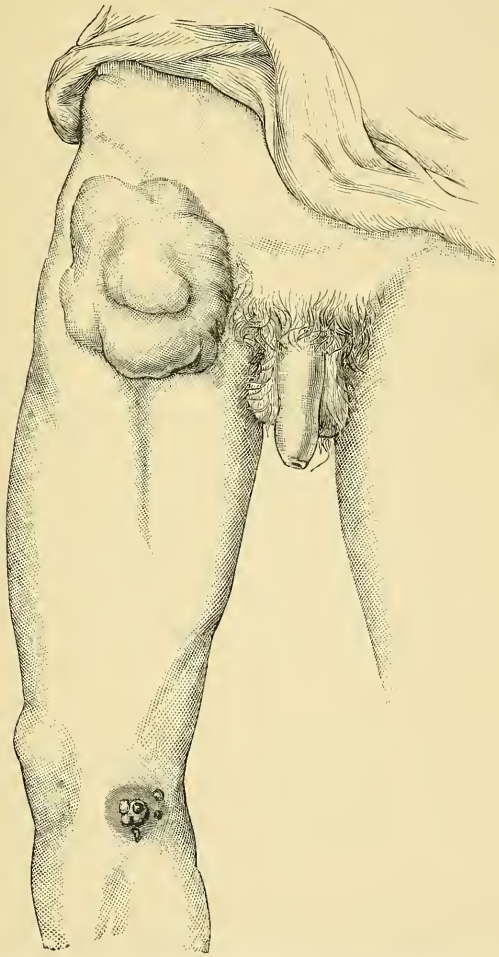

Fig. 65.—Pigmented mole which ulcerated and infected the inguinal lymph glands; the patient was sixty-five years of age.

to become more prominent, and finally forms a tumour of some size standing out prominently from the skin. In due course the lymph glands, in anatomical relation with the

part from which the tumour arose, enlarge, and secondary deposits occur in the viscera, bones, or skin.

It does not necessarily follow that in all cases of melanomata occurring in moles secondary deposits are formed in the viscera. In some cases, which, however, are very rare, the tumour seems to become mainly a source of pigment, large quantities of which enter the circulation to be discharged with the urine in which it is recognised as melanin. Exceptionally the skin will assume a dusky tint, and in one instance in which a woman with a melanoma died immediately after a menstrual period, I found the corpus luteum and some distended follicles filled with an inky fluid.

Digital Melanomata.—Melanosis in connection with the fingers and toes assumes two forms: it may occur as a deep pigmentation of the skin, usually in the immediate neighbourhood of the nail, often involving the matrix, and even the nail itself; or a small pigmented nodule will arise in the nail matrix or in the adjacent skin. These nodules quickly ulcerate, and dissemination follows. In some of these nodules the pigment is very scanty—indeed in some cases it is only discovered with the microscope; yet secondary nodules of an intense black colour will arise in the various organs and tissues.

The hallux is the digit most prone to be attacked by melanomata, and several examples have been carefully recorded, most of the patients being women. These cases are arranged in the following table :—

Fergusson .	M.	36	Hallux . .	*Lancet*, 1857, i., p. 290.
Hutchinson.	F.	60	Hallux . .	*Trans. Path. Soc.*, Vol. viii., p. 404.
Nunn . .	F.	50	Fifth Finger.	*Ibid.*, Vol. xxxi., p. 299.
Lediard .	F.	40	Index Finger	*Ibid.*, Vol. xxxix., 307.
Bowlby .	F.	55	Hallux . .	*Ibid.*, Vol. xli., 314.

Intra-ocular Melanomata.—Pigmented tumours arising within the eyeball belong to two genera, sarcoma and carcinoma. Of these, the melano-sarcoma is very much more frequent than the melano-carcinoma.

Melano-sarcomata may arise from any part of the **uveal tract**—that is, from the pigmented connective tissue in relation with the iris, the ciliary body, or the choroid. A

melano-sarcoma of the iris is excessively rare, and it is probably ten times more common in the choroid than in the ciliary body. (Fig. 66.)

Fig. 66.—Melano-sarcoma of the uveal tract.

In structure the sarcomatous elements may be round-celled, spindle-celled, or mixed-celled, the size of the cells varying greatly in different specimens.

They occur during youth, cases having been observed as early as the fifteenth year; but the liability increases with age. By far the greater number of recorded cases has been met with between the age of forty and sixty years, and a case has been reported as late as the eighty-fourth year.

The amount of pigment in intra-ocular melanomata varies greatly; in some specimens it is so abundant that the tumour is coal-black; in others it is only sufficient to impart a grey tint. Occasionally the pigment is so irregularly distributed that some parts of it are colourless.

The tumour remains for a time restricted to the interior of the globe, but it tends to escape therefrom in three directions: (*a*) along the course of the venæ vorticosæ, and appears outside the sclerotic in the situations where these veins emerge; (*b*) the presence of the tumour leads to an increase in the intra-ocular tension, and finally sloughing of the cornea; (*c*) the growth may invade the optic nerve.

Melano-sarcomata, like all species of sarcomata, are very apt to recur after removal, and to become disseminated. The most frequent situation in which to find secondary deposits is the liver (Fig. 67); but any organ may contain them, even the bones. It is surprising, considering that the eyeball is so near to, and in such close relation with the brain, by so large a nerve-trunk as the optic nerve, that it should be so rarely implicated. It is a fact that when the brain is the seat of deposit it is excessively rarely the result of extension along the nerve. The amount of dissemination varies greatly; in some cases secondary knots occur in almost every organ; in others they will be limited to the liver. The lymph glands adjacent to the orbit are rarely infected. It is curious that in most cases death results more often from the secondary growths

involving important organs than from the local effects of the primary tumour.

An excessively rare complication of melanotic tumours is

Fig. 67.—Secondary nodules of melano-sarcoma in the liver.

pigmentation of the skin. An admirable example of this has been recorded by Dr. Wickham Legge* (Plate II.). The patient, a shoemaker, had the left eye enucleated at the Ophthalmic Hospital, Moorfields, when he was fifty-eight years of age, for

* Trans. Path. Soc., vol. xxxv., p. 367.

PLATE II.—Melanosis of the Skin, secondary to Melano-sarcoma of the Uveal Tract. (*Wickham Legge.*)

melanotic spindle-celled sarcoma. He died twenty months later in St. Bartholomew's Hospital, with secondary nodules in various organs, particularly the liver. The most remarkable feature in the case was that six months before death his face began to assume a dark appearance, and on his admission into the hospital the appearance of his face strongly suggested argyrism, but the most careful interrogatories failed to bring out any evidence that the man had ever taken silver salts. In this case it is worthy of note that the urine gave a deep brown colour with hydrochloric acid and chloride of calcium; the colour on standing deepened to black. No dark granules were ever found in the urine. At the post-mortem examination an abundance of dark-coloured fluid escaped from the belly.

In some rare cases pigmentation of the skin, secondary to melanomata, assumes the form of discrete circular spots, varying from two to four mm. in diameter. I have counted three thousand of these spots in one patient.

2. **Melano-carcinomata.**—Several writers who have devoted attention to intra-ocular growths describe some of the pigmented tumours as carcinomata, using the term in the definite sense with which it is employed in this work. Much new light has been thrown on this question by the interesting investigations of Treacher Collins.* This ophthalmologist has demonstrated the existence in the ciliary body, in the space extending from the root of the iris to the ora serrata, of a number of small tubular processes composed of epithelial cells with their free ends projecting towards the ciliary muscle. Collins succeeded in demonstrating the existence of these processes by ingeniously depriving the cells of their pigment by bleaching; he regards these processes as glands, which secrete the aqueous humour. The ciliary glands are interesting in connection with melano-carcinoma, for Collins discovered among the intra-ocular tumours preserved in the museum of the Moorfields Hospital, two examples from the ciliary body which were epithelial in character. In examining them he adopted the bleaching method to which reference has already been made.

The **duration of life** in patients with intra-ocular melanomata rarely extends beyond three years. A careful analysis of a large number of cases shows, however, that in many instances

* Trans. Ophthal. Soc., London, vol. xi.

life may be indefinitely prolonged by early removal of the globe, and cases are known in which patients have been reported alive and well five, six, eight, nine, sixteen and eighteen years after the operation. In the majority of cases that recur, the recurrence takes place within three years of the operation. Collins and Lawford,* calculating cases in which recurrence does not take place within three years of operation as recovery, come to the conclusion, from an analysis of seventy-nine cases of which they were able to obtain complete records, that the rate of recovery is twenty-five per cent., but they point out that patients have died from recurrence or secondary deposits after a much longer interval than three years. J. Hutchinson, junr.,† has mentioned a case in which dissemination was deferred for eleven years after an eye had been excised for melanoma.

Melano-sarcomata in horses are of fairly common occurrence; the regions most affected are the tail and the parts about the anus, where they form large mushroom-like excrescences, with little disposition to ulcerate. The tumours in some cases attain large proportions, and have been known to weigh forty, fifty, and even sixty pounds. When a large tumour grows from a horse's tail it becomes a great encumbrance, which the veterinarian removes by amputation. It occasionally happens that in the operation a portion of the tumour is left behind, and its cut surface heals like other tissues. These pigmented tumours are very prone to disseminate, and secondary nodules occur in almost all the viscera: yet, in spite of this, melano-sarcoma does not appear to be such a malignant affection in horses as in men.

Although most common in grey, it also occurs in white, and occasionally in black horses, and it certainly occurs in cows. Next to the anus and tail, the udder is the most frequent seat of the primary tumour, and it may spring up in the subcutaneous connective tissue in any part of the trunk. Horses may be attacked at any age from four years upwards. In structure melano-sarcoma of the horse resembles a hard uterine myoma rather than a sarcoma. In these animals melano-sarcoma of the uveal tract is very rare.

* "Notes on One Hundred and Three Cases of Sarcoma of the Uveal Tract." R. Lond. Ophth. Hosp. Rep., Dec., 1891.

† *Brit. Med. Journal*, 1893, vol. i., 291.

CHAPTER XIV.

SARCOMATA (*concluded*).

Treatment.—Although the principle involved in the treatment of sarcomata is expressed in the following brief sentence—**early and complete removal when they occur in accessible positions**—nevertheless the mode of effecting this varies according to the organ involved. In a few situations, such as the mediastinum, basal parts of the brain, skull-base, bodies of vertebræ, the pelvic bones and the liver, the successful removal of a sarcoma is an impossibility. Occasionally, in other parts of the body, the tumour grows rapidly and infiltrates so wide an area of tissue that its extirpation would involve such an extensive operation as to render recovery extremely doubtful or impossible.

When there is evidence of dissemination it is then too late to interfere, unless the primary tumour is a source of such pain and discomfort that its removal is demanded merely to relieve the patient.

The means employed in the operative treatment of sarcomata (unfortunately nothing short of this is of the least use) vary according to the seat of the tumour. There are a few definite rules followed by surgeons in this matter.

Bones.—In the case of sarcomata of the **limb bones** it is usual, except in the case of myeloid tumours, to amputate the limb at such a point as shall remove the affected bone.

For instance, if the sarcoma involve the **tibia** or **fibula,** amputation should be performed at the knee joint or lower third of the thigh. In the case of the **radius** or **ulna** the limb should be removed at the elbow or lower third of the arm. When the **humerus** is the affected bone, it should be removed at the shoulder joint, or even the scapula removed with it when the tumour implicates the upper end of the bone. In the case of the **femur** the usual practice is to amputate at the hip joint for periosteal sarcoma of the lower third of this bone; when the tumour is central the operation may be carried out in the upper third of the thigh. When the tumour involves the upper half of the femur, amputation

may sometimes be carried out: but, as a rule, it is not a proceeding to urge upon the patient.

Myeloid Sarcomata do not demand such vigorous treatment as the other species. In the case of the upper limb it is only necessary to excise the affected end of the bone. This was demonstrated by Morris.* In 1876 this surgeon excised the lower end of the right radius and lower fourth of the ulna. (Fig. 68.) Sixteen years later the patient was free from

Fig. 68.—Forearm of a woman four years after excision of the lower fourth of the ulna and the radius for a myeloid sarcoma of the radius. (*After Henry Morris.*)

recurrence, and the hand was so useful that I have seen her hold a needle with the thumb and forefinger. Lucas† followed this example and resected the lower end of the left ulna in a woman twenty-nine years of age. Ten years later she was free from recurrence. In 1890 I excised the outer third of the clavicle ‡ for a myeloid sarcoma of the acromial end of this bone; three years later the patient was in good health and free from recurrence. Clutton§ excised the upper three inches of the radius for myeloid sarcoma in a man twenty-eight years of age; the patient recovered with free movement of the elbow. The man survived the operation eighteen months, then died of kidney disease (albuminuria). There was no recurrence.‖

The **maxilla** is frequently removed when involved by a sarcoma. In exceptional cases both maxillæ have been excised at one operation. In the case of the **mandible** it is usual to remove the affected half; in a large proportion of cases the surgeon is content to leave the ramus of the bone, unless it be implicated.

* Trans. Clin. Soc., vol. x. 138, xiii. 155, and xxii. 367.

† Trans. Clin. Soc., vol. x. 135, and xxii. 366.

‡ Trans. Clin. Soc., vol. xxiv. 12.

§ Museum Cat., St. Thomas's Hospital, Part i., p. 105, No. 659.

‖ *See* Mott's case, foot-note, p. 125.

In cases of large sarcomata growing in situations where removal is an impossibility, ligature of the main artery supplying it has been practised. Treves * has recorded an encouraging case of this kind. A lad sixteen years of age had a large rapidly-growing sarcoma of the buttock. Ligature of the left internal iliac artery was followed by rapid diminution of the tumour. Ten months later it began to grow again, and the patient died fourteen months after the ligature of the artery.

Muscles.—It is the usual practice to dissect out if possible the whole of the affected muscle. This operation has been carried out in a few instances, but in many cases, such for instance as the peroneus longus and the gracilis, it is easy enough to remove the bellies of the muscles, but the tendons offer greater difficulty. When several muscles are implicated, or when there is recurrence, it is safer to remove the limb above the origins of the affected muscles if this is practicable.

Secreting Glands.—In the case of the parotid and submaxillary glands, sarcomata, especially those in which cartilage is abundant, will occasionally shell out, but in many the periosteum of the mandible is implicated. It is then necessary to remove freely the involved portion of this bone.

Genital Glands.—Castration is the proper treatment for sarcoma of the **testis** so long as it is possible to remove the gland above the disease. When the cord is extensively involved operative interference is, as a rule, very useless.

In the case of the **ovary** it is often difficult to decide between a cyst, a sarcoma, or a dermoid of moderate dimensions; the presence of ascites is always a suspicious, but by no means absolute, sign of malignancy. Ovariotomy has been many times performed for sarcoma, and should always be advised in adults so long as there is no evidence of dissemination. In children it is a useless proceeding. (*See* page 123.)

Eyeball.—Early removal of the eyeball for an intra-ocular sarcoma is the mode of treatment that should be earnestly urged upon the patient.

Skin.—In the case of skin, sarcomata should be freely excised, and the adjacent lymph glands removed at the same time.

* Trans. Clin. Soc., vol. xxv. 249.

Kidney.—It has been customary in previous writings on the operative treatment of renal sarcomata to include in one table all cases irrespective of the ages of the patients; it was pointed out in describing sarcomata of the kidneys that they occur at two periods of life—viz., during infancy and in adult life, the period of youth being almost exempt from these tumours.

This fact comes out in a very striking manner in the accompanying tables, where sarcomata of infants are arranged

OPERATIONS FOR RENAL SARCOMATA IN CHILDREN UNDER SIX YEARS OF AGE.

Reporter.	Age.	Result of Operation.	Reference.
Ollier	4½ yrs.	D.	*Révue de Chir*, 1883, 898.
Jessop	2¼ yrs.	R. Recurrence and death in 9 mths.	*Lancet*, 1877. Vol. i. 889.
Kocher	2½ yrs.	D.	*Deut. Zeitsch. für Chir.*, Bd. ix. 312.
Czerny	11 mths.	D.	*Deut. Med. Wochensch.*, 1881, No. xxxi. 422.
Hueter	4 yrs.	D.	*Deut. Zeitsch. für Chir.*, Bd. ix. 527.
Croft	2 yrs.	R. Recurrence and death within a yr.	*Trans. Path. Soc.*, Vol. xxxvi. 274.
Godlee	1 yr. 10 mths.	R. Recurrence and death in 6 mths.	*Trans. Clin. Soc.*, Vol. xviii. 31.
Meredith	4 yrs.	D.	*Brit. Med. Journ.*, 1884. Vol. ii. 863.
Owen	10 mths.	D.	*Cat. Mus. St. Mary's Hptl.*, 1891.
Pughe	2 yrs. 4 mths.	D.	*Trans. Path. Soc.*, Vol. xxxi.
Alsberg	5 yrs.	R. Recurrence, death in 11 weeks	*Deut. Med. Wochensch*, 1887, 873.
Rawdon	1 yr. 9 mths.	D.	*Liverpool Med.-Chir. Jour.*, Vol. iii., 252.
Taylor	1 yr. 8 mths.	D.	*Am. Jour. Med. Sci.*, 1887, 470.
Brokaw	3 yrs. 8 mths.	R. Rec. and death 2 mths. later.	*Phil. Med. News*, 1891, lviii. 313.
Author	1 yr. 6 mths.	D.	Unpublished.
A. Czerny	3½ yrs.	D.	*Arch. für Kinderkrank.*, Bd. xi. 247.
König	6 yrs.	R. Rec., death in 5 mths.	*Deut. Zeitsch. für Chir.*, Bd. xxix. 590.
König	2 yrs.	R. Rec. in 3½ mths.	
König	1 yr. 3 mths.	D.	
Fischer	4½ yrs	R. Rec. and death in 4 mths.	
Walsham	10 mths.	R. Rec. within 12 mths.	*Brit. Med. Journal*, 1893, Vol. i. 694.

The facts expressed in the above Table amount to this:—There were 21 operations, with 9 recoveries and 12 deaths. Of those which recovered from the operation, all were dead within a year.

OPERATIONS FOR RENAL SARCOMATA IN ADULTS.

Reporter.	Age.	Result of Operation.	Reference.
Barker	21	D.	*Med.-Chir. Trans.*, lxiii. 191.
Thornton	25	D.	*Med.-Chir. Trans.*, lxxii. 313.
Thornton	53	R. Died 1 year later with recurrence	,, ,,
Morris	51	D.	*Brit. Med. Journ.*, 1893, Vol. i. p. 2.
Morris	70	D.	,, ,,
Morris	55	R. Died 3 mths. later	,, ,,
Morris	35	R. Died 3 mths. later with recurrence,	,, ,,
Morris	43	R. Died within a year.	,, ,,
McCarthy	37	R. Died a few weeks later with rec.	*Trans. Path. Soc.*, Vol. xxxvii. 295.
Author	54	D.	Unpublished.
Skene Keith	61	D.	*Edin. Med. Journ.*, Oct. 1886, p. 351.
Adams	39	R. Died in six weeks.	*Med. Times and Gaz.*, 1882, Vol. ii. 678.
Whitehead	46	D.	*Brit. Med. Journ.*, 1881, Vol. ii. 741.
Sp. Wells	58	D.	*Med.-Chir. Trans.*, Vol. lxvi. 305.

In this Table there are 14 operations, with 6 recoveries and 8 deaths. Of those who recovered, all were dead from recurrence within the year.

in one table and sarcomata of adults in another. Many of the tumours in adults were recorded as examples of "encephaloid," a term which has no meaning for the pathologist, and for the surgeon has probably the same significance as sarcoma.

It is necessary to mention that Ris* has reported a case in which Kronlein of Zurich excised a kidney from a woman fifty-six years of age for a tumour, described by Klebs as an adeno-sarcoma; the patient was alive and well five years after the operation.

Nephrectomy for renal sarcoma in children is absolutely unavailing, and is fast falling into disfavour. The excision of a sarcomatous kidney in adults is occasionally a measure of necessity, on account of the great pain and distress it induces. It is curious that renal sarcomata cause no pain when they occur in young children.

It is as yet impossible to speak definitely in regard to the results of excision of adrenal tumours until more of these cases have been accurately studied. At present there is good reason to believe that they are less malignant than renal sarcomata.

* Bruns, *Beiträge*, bd. vii., 146.

The Results of the Operative Treatment of Sarcomata.—A comprehensive study of this question indicates that the results of operations for sarcomata are influenced by the situation as well as by the nature of the tumours.

It is a somewhat remarkable fact that the two most deadly situations in which sarcomata grow are the periosteum of the femur and the maxilla. In the majority of cases in which amputation is performed for round- or spindle-celled sarcomata of the femur, the patients die within a year of the operation. Many of them succumb at the end of three months, the fatal result being due in most patients to secondary deposits in the lungs.

In the case of the maxilla, life is rarely prolonged beyond a year; the patients in a few instances die from rapid and extensive recurrence, or from broncho-pneumonia, rarely from dissemination.

In other bones far better results are obtained, and where limbs have been cut off for sarcoma of the tibia, fibula, radius, or ulna, life has been prolonged for several years, even in young individuals.

Central tumours of bone are much more favourable than the periosteal, and this holds good when allowance is made for the fact that myeloid sarcomata have been included in the statistical lists from which the conclusions were drawn. Myeloid sarcomata give the best results, and references have already been made (p. 118) to cases that have been reported.

The results of **ovariotomy** for sarcoma are not very encouraging. Thornton* published records of ten cases in which the patients submitted to operation. Of these, three died from the effects of the operation; of the seven which recovered, one remained in good health and had a child two years later. One died a few months after the operation from recurrence in the pelvis. Another had recurrence eighteen months later. The remaining four died within a year of the operation from dissemination of the growth. A careful analysis of the statistical tables of other surgeons gives almost identical results. The above facts indicate the greater risk of ovariotomy for sarcoma than other genera of ovarian tumours. This is even

* *Med. Times and Gaz.*, 1883, vol. i., 383.

more forcibly illustrated by the following facts. A search through periodical literature enabled me to collect seventy cases in which ovariotomy had been performed in girls under fifteen years of age, with the following results :—

Dermoids, 29, with 25 recoveries.
Cysts, 29, „ 27 „
Sarcomata, 12, „ 5 „

The cases of sarcomata are subjoined in tabular form.

OPERATIONS FOR OVARIAN SARCOMATA IN CHILDREN.

Reporter.	Age.	Result.	Reference.
Chenoweth	8 yrs.	D.	*Am. Journal of Obstet.*, Vol. xv. 625.
Cameron	8½ „	D.	*Glasgow Med. Journal*, 1889, p. 37.
Malins	9 „	D.	*Lancet*, 1890, Vol. i. 1174.
Wagner	10 „	R.	*Arch. für Klin. Chir.*, Bd. xxx. 504.
Croom	11 „	R.	*Obstet. Trans., Ed.*, Vol. xiv. 93.
Wagner	13 „	D.	*Arch. für Klin. Chir.*, Bd. xxx. 504.
Smith	14 „	D.	*Lancet*, 1874, Vol. ii. 501.
Tsander	15 „	R.	*Vrach*, No. 48, 1890, 1087.
Thornton	15 „	D.	*Med. Times and Gaz.*, 1883, Vol. i., p. 211.
Von Szabo	15 „	D.	*Arch. für Gyn.*, Bd. xxxii. 193.
Kelly	12 „	R.	Keating's *Cyclopædia*, Vol. iii. 739.
Croom	7 „	R.	*Ed. Med. & Surg. Jour.*, 1893, 689.

It would have been very interesting to know the subsequent history of the few patients who recovered, in order to make the table as complete as that which relates to nephrectomy for renal sarcomata in young children. This may, perhaps, be possible in future records.

It is a fact that should be emphasised that convalescence is very tardy after ovariotomy for sarcoma.

An examination of the clinical records of ovarian tumours in children under fifteen brings out another point: cysts and dermoids, as well as sarcomata, compass the death of the patient at periods varying from a few months to three years, when the tumours are allowed to remain.

It might seem that in the case of the ovary the rapidly fatal results could be ascribed to the fact that the diseased gland, lying concealed within the pelvis, had wrought serious general mischief before the existence of the tumour was discovered. This opinion is set aside by the fact that sarcomata of

the testis give scarcely better results, and here the glands are more accessible to clinical observation. Of course the number of deaths directly due to the effects of castration as compared with ovariotomy is very much smaller, indeed death from castration is an excessively rare event.

When a sarcoma has been removed and recurs, this may be taken as an indication that the morbid tissue was not completely removed, and in the present state of surgical art we have no absolute test whereby to decide this all-important question. In a few cases, when operations are in progress, we find, to our disappointment, that complete eradication is impossible.

When a sarcoma recurs, the surgeon may, in suitable cases, remove the recurrent tumour, so long as there is no definite sign of general infection. An encouraging case in this direction has been recorded by Lawson.* In 1865 Sir William Fergusson removed a large parotid chondro-sarcoma from a woman; from that date to 1883 this tumour recurred and was removed four times by Fergusson and six times by Lawson.

The most important collection of facts demonstrating the value of **early removal** of sarcomata is the careful inquiry into **retinal sarcoma** conducted by Lawford and Collins, to which reference has already been made; they bring out very clearly the following points:—The quicker an eye is removed after the discovery of the disease the better the prospect of cure. In the majority of cases the disease returns in the orbit, and in a very small proportion of cases secondary deposits occur in other parts. When recurrence takes place it is rarely delayed beyond nine months; but one undoubted case has been reported in which the disease returned three years after the primary operation. If three years elapse and there is no recurrence the recovery may be regarded as permanent. Out of fifty-four cases in Lawford and Collins's list, eight patients were alive and free from recurrence three years after the removal of the eye for retinal glioma; this, in comparison with the inquiries of others, would seem to indicate the proportion of recoveries. It is significant to note that in seven of these cases the disease affected one eye only. This shows the almost hopeless condition of the patient when both eyes are affected.

* Trans. Path. Soc., vol. xxxiv. 261.

The results of operations for sarcomata are largely influenced according to the species with which we have to deal. For instance, lympho-sarcoma and the small round-celled species are very deadly; they recur quickly, and disseminate rapidly and extensively. The presence of cartilage is a favourable sign, for pure spindle-celled sarcomata destroy life more rapidly than those that undergo chondrification; the more abundant the cartilage, the longer are recurrence and dissemination delayed; to this there are occasional exceptions. A broad survey of the clinical effects of the various species and varieties of sarcomata permits their **malignancy** to be relatively expressed thus :—

Lympho-sarcoma.
Small round-celled sarcoma.
Melano-sarcoma.
Spindle-celled myo-sarcoma.
„ chondro-sarcoma.
Myeloid sarcoma.*

An impartial consideration of the evidence at our disposal clearly indicates that in a small proportion of cases early removal of a sarcoma will effect a cure. In a large proportion of cases it retards the dissemination of the tumour, and therefore prolongs life. In many instances it exercises no beneficial effect whatever, and a certain proportion of patients succumb from the effects of the operation. It is, however, important to keep well in mind the fact that an operation, even if it does not cure or even if it retards the progress of the disease, very often relieves the patient not merely of an encumbrance, but of a condition which is the source of great distress, mental anguish, and ofttimes intense pain.

* Apart from the cases referred to on page 118, reference must be made to Mott's celebrated case. In 1827 he excised the inner two-thirds of the clavicle for osteo-sarcoma (myeloid sarcoma) of the sternal end in a lad 19 years old. The patient survived the operation 54 years. *See* Dr. Porcher, *Am. Jour. Med. Sci.*, vol. lxxxv., 146.

CHAPTER XV.

MYOMATA.

Myomata are tumours composed of unstriped muscle fibres. This genus contains but one species, sometimes spoken of as leiomyomata, in contradistinction to rhabdomyomata, tumours containing spindle cells possessing a transverse striation. The rhabdomyoma is a variety of the spindle-celled sarcoma. (*See* Myo-sarcoma.)

Myomata are met with in the uterus, broad ligament, ovary, ovarian ligament, the round ligament of the uterus, the vagina, œsophagus, stomach, intestine, scrotum, skin, bladder, and prostate.

Myomata are encapsuled tumours composed of long fusiform cells with a rod-like nucleus: the size of the cells varies greatly in different tumours. The bundles of muscle fibres are often interwoven in such a manner that the cut surface presents a characteristic whorled appearance. Sometimes it is exceedingly difficult to decide between muscle cells and the large spindle cells belonging to a sarcoma, or the cells of a fibroma.

Uterine Myomata.—Before considering the characters of myomata of the uterus and the structures connected with it, attention will be drawn to a few points in the distribution of its muscle fibres.

The uterus is a muscular organ, and its fundus, with the chief portion of its body, is closely invested with peritoneum directly continuous laterally with the folds known as the broad ligaments. The cavity of the uterus is lined with mucous membrane rich in glands and pervaded with unstriped muscle tissue. The mucous membrane is so directly continuous with the muscular walls of the uterus that it is impossible to decide accurately where the mucous membrane ends. Making every allowance for this, the uterine mucous membrane contains a fair quantity of unstriped muscle tissue. So with the serous investment of the uterus; the peritoneum forming the broad ligament contains a stratum of unstriped muscle tissue, which is directly continuous with the

muscle tissue underlying the peritoneum covering the uterus. Indeed, the most superficial layer of muscle tissue on the uterus belongs not to this organ but to the peritoneum. In young adults it is possible to separate from the fundus of the uterus, a layer of tissue directly continuous with the muscular stratum of the broad ligament.

Thus we have three situations in the uterus in which myomata may arise :—

1. In the true uterine tissue ; such are called *intramural.*
2. In the muscle tissue of the mucous membrane, *submucous myomata.*
3. In the muscle tissue immediately beneath the serous membrane ; these are known as *subserous myomata.*

This division is not only pathologically correct, but it is clinically convenient. In addition to myomata falling under each of these heads it will be necessary to consider similar tumours springing from the muscle tissue of the (*a*) *broad ligament,* (*b*) the *round ligament,* and (*c*) the *ovarian ligament.* The last two may be considered as muscular processes of the uterus.

1. **Intramural Myomata.**—Tumours originating in the uterine walls may be single or multiple. In their early stages they resemble in section knots in a piece of wood. (Fig. 69.) These tumours are distinctly encapsuled, and are firm and even hard to the touch.

In such an early stage as is represented in Fig. 69 myomata cause inconvenience, and even such small tumours are accompanied by a slight enlargement of the uterus. They may arise in any part of the uterine wall, and there is no limit to their growth.

It not infrequently happens that when a myoma is confined to one wall of the uterus and appears as a single tumour externally, it will be found on section to consist of two or more tumours growing in association, but each possessing its own capsule. This also holds good of many specimens described as " general myomatous enlargement of the uterus," in which this organ is so uniformly enlarged as to resemble an enormous pear.

Uterine myomata sometimes attain gigantic proportions, weighing fifty, sixty, and seventy pounds.

Myomata vary greatly in their rate of growth; those which grow slowly are, as a rule, very hard, and contain a large proportion of fibrous tissue; such are moderately vascular. The softer examples contain but little fibrous

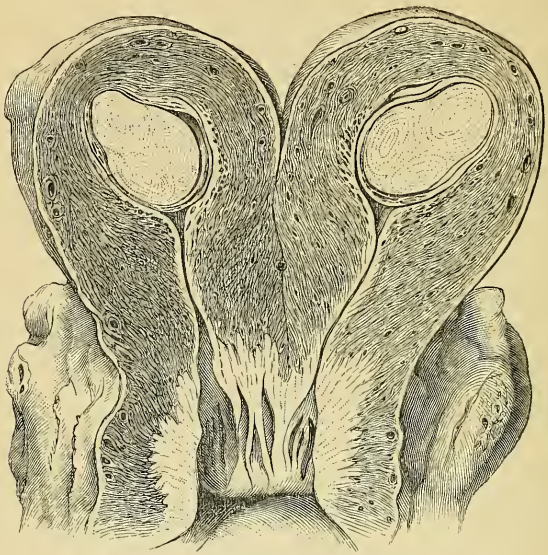

Fig. 69.—Section of a uterus showing a small myoma.

tissue, their cells are large, they grow rapidly and are very vascular. The vessels that traverse these tumours are often of large size, especially the veins, and furnish a loud systolic bruit on auscultation.

Some of these intramural myomata are so richly furnished with blood-vessels that on transverse section they look not unlike erectile tumours. Indeed, Virchow* speaks of them as *cavernous* or *telangiectatic myomata*. The vessels seen on the cut surface are for the most part veins. An excellent notion of the extreme vascularity of such tumours may be gathered from Fig. 70, and it may easily be conceived that, under varying conditions of the circulation, such tumours would alter in size, and in some cases this has been so marked that the tumour seemed to be erectile.

The amount of blood myomata contain is well seen when

* "Die Krankhaften Geschwülste," bd. iii., 195.

operating upon them. When blood is prevented from entering them the cut surface is quite white, and when it is allowed to enter, the tumour swells up like a sponge and at once becomes of a lively pink colour.

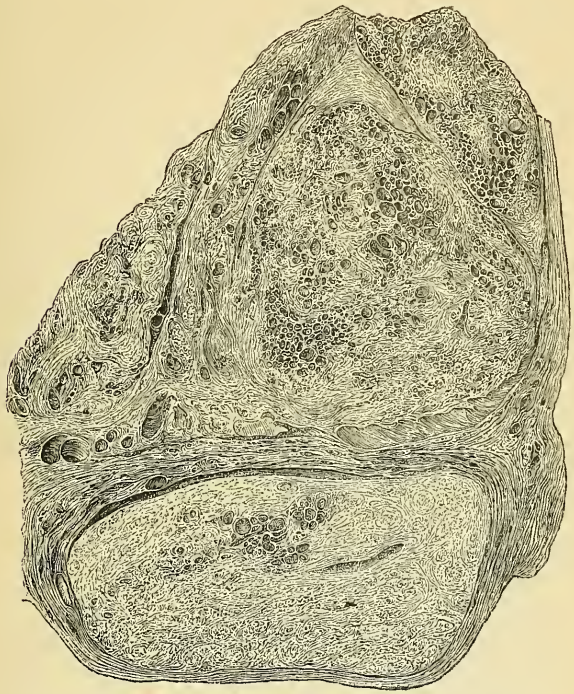

Fig. 70.—Very vascular uterine myoma seen in section. (*After Virchow.*)

2. **Submucous Myomata.**—Myomata springing from the muscle tissue in the mucous membrane, as soon as they attain an appreciable size, project into the uterine cavity and give rise to one variety of "fleshy polypus of the womb." Submucous myomata are at first sessile and invested on the surface which projects into the cavity of the uterus with mucous membrane. As they increase in size they dilate the uterine cavity and tend to become pedunculated.

The presence of the tumour within the uterus acts in the same way as an impregnated ovum, inasmuch as its continued increase in size reacts upon the uterine tissue and leads to great thickening of its walls, accompanied by increased

vascularity, which is often manifested by irregular haemorrhage from the uterus, or at least by undue losses of blood at the menstrual periods.

It occasionally happens that the pedicle of a submucous myoma may become so elongated as to allow the myoma to pass through the cervical canal and emerge into the vagina, and even protrude at the genital orifice. When this happens, an interesting change takes place in the character of the epithelium of the extruded part. So long as the myoma is contained within the cavity of the uterus, the mucous membrane covering it is indistinguishable from that lining the

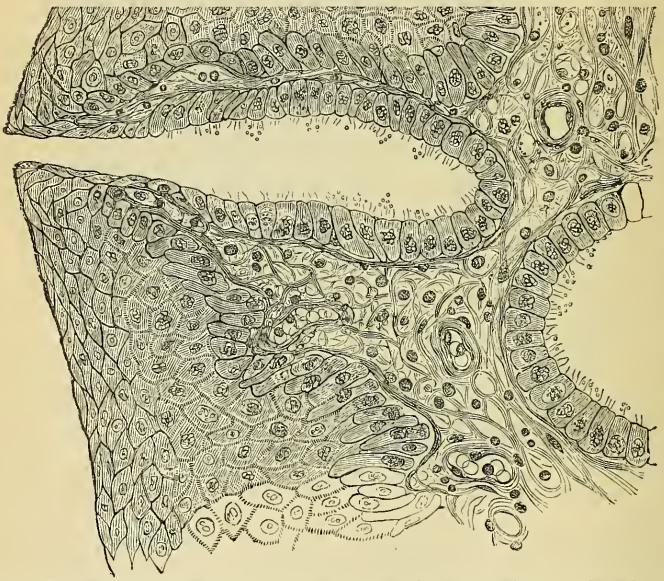

Fig. 71.—Microscopical appearance of the mucous membrane covering a prolapsed uterine myoma, showing mutation of columnar ciliated into stratified epithelium as a result of pressure. (*After Gervais.*)

general cavity of the uterus, and the surface epithelium, as well as that lining the recesses of the glands, is of the columnar ciliated variety. When the myoma enters the vagina, the epithelium covering the projecting portion becomes converted into stratified epithelium on all those parts submitted to pressure, but the epithelium in the glandular recesses not exposed to pressure remains columnar and ciliated. This mutation of epithelium is shown in Fig. 71.

The extrusion of a myoma through the cervical outlet of the uterus sometimes ends in complete detachment of the tumour. This is, of course, curative, but it is very rare; unfortunately the extrusion more frequently leads to secondary changes, which are in the long run inimical to life. When a large myoma passes beyond the external orifice of the uterus, the part lying within the canal is firmly grasped by the contraction of the uterine walls bounding the internal orifice. Should the tumour be very vascular the venous circulation is interfered with, and the projecting part becomes œdematous. The sequence in such a case is identical with œdema of a leg secondary to thrombosis of the corresponding external iliac vein. Should the compression continue, the extruded parts become congested and may even necrose, and as the dead tissue is in a situation easily accessible to air, and consequently to putrefactive organisms, gangrene, with all its attendant evils, is the result.

Myomata, sometimes of large size, arise from the neck of the uterus and project into the vagina, and thus simulate very closely the large pedunculated tumours which grow from the uterine fundus.

A submucous myoma may invert the fundus, and an inverted uterine fundus sometimes simulates a submucous myoma.

3. **Subserous Myomata.**—Tumours growing from the layer of muscle tissue immediately subjacent to the peritoneal covering of the uterus, when numerous, rarely attain a large size. When the number is limited to three or four, one or more of them may attain moderate proportions. Like the submucous variety, subserous myomata quickly become pedunculated, and when numerous they cause the uterus to assume a characteristic tuberous appearance. Sometimes as many as fifteen or twenty of these protuberances may be counted on a uterus, and they vary in size from a pea to a large walnut. In such cases, even when no intramural myomata are present, the walls of the uterus are thicker than natural. Subserous myomata of this character rarely cause any inconvenience, and are often found after death in individuals in whom they have never produced the least inconvenience during life, or in whom their presence has not even been suspected. Large

single, pedunculated, subserous myomata, weighing two or more pounds, sometimes cause trouble from the mechanical effects they are liable to produce.

Any of the three varieties may occur together in the uterus —indeed it is usual to find the subserous and intramural myomata associated. (Fig. 72.) Intramural tumours are often

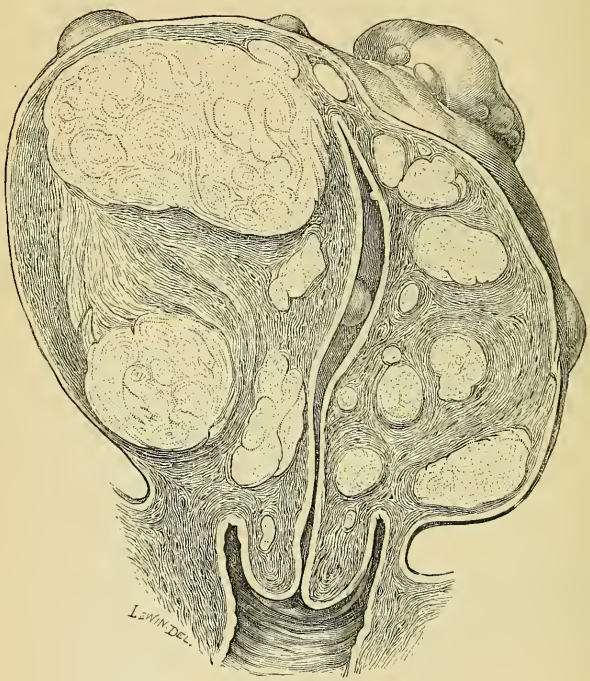

Fig. 72.—Section of a uterus with multiple myomata.

present alone; but it is by no means rare to find moderately large examples in the uterine walls accompanied by a small submucous myoma, and the latter is far more frequently the source of dangerous hæmorrhage and pain than its large companions.

It is usual, in works dealing with uterine myomata, to describe each variety as having a common origin in the uterine wall and then remaining intramural, or becoming subserous, or submucous, according to circumstances. It cannot be denied that occasionally large intramural myomata will project into the uterine cavity and even become extruded, but such rarely become pedunculated; they will also often protrude on the

abdominal aspect of the uterus, but a critical dissection will show that there is a layer of uterine tissue intervening between the tumour and the peritoneum. The majority of small subserous myomata spring up in the subperitoneal stratum of muscle tissue and belong to it. In the same way the small submucous myomata originate in the muscle tissue of the uterine mucous membrane.

Uterine myomata are liable to **secondary changes**, which it will now be convenient to consider.

Mucoid Degeneration.—Large uterine myomata are especially prone to undergo this change, whereby large tracts of the tumour substance soften and become converted into mucin; in some specimens this takes place so extensively that the tumour is converted into a spurious cyst, the only part which retains its original structure being the capsule. Myomata of this description are often described as "fibro-cystic tumours." The actual conversion of the tissue substance is preceded by œdema of the connective tissue, and the cells assume the characteristic spider-like form to which the term myxoma is applied. Sections of the tissue which forms the boundary of the softened spaces in the tumour exhibit every gradation, from fusiform cells to the irregularly branched cells peculiar to myxomatous tissue, embedded in a structureless matrix identical in its physical characters with the vitreous humour of the eye. Mucoid changes in uterine myomata are usually accompanied by rapid increase in the size of the tumour.

Fatty Metamorphosis.—Uterine myomata sometimes undergo this change. In rare instances a localised collection of fat has been found in the middle of a pedunculated myoma.

Calcification.—Old uterine myomata, both large and small, are liable to become infiltrated with earthy matter. The change only occurs in slow-growing tumours containing a large proportion of fibrous tissue. The calcareous material is not deposited in an irregular manner in the tissues of the tumour, but corresponds to the disposition of the fibres; on examining the sawn surface of a completely calcified uterine myoma we find the whorled disposition of the fibres so completely reproduced as to leave no doubt as to the nature of the mass. When these calcified tumours are macerated, and the decayed tissues washed away, the earthy matter retains the

shape of the tumour, but its exterior presents an irregular, porous, almost worm-eaten appearance. The calcification is confined to the tumour itself, and though we may occasionally find isolated nodules of earthy matter dotted about the capsule, this part of the tumour is not converted into a hard, resisting shell.

If a partially calcified myoma became extruded into the vagina and decomposed, the soft tissues escaping with the discharges, it can easily be understood that the residual calcareous mass, in days when the anatomy of such tumours was not known, would be somewhat of a clinical puzzle. It was formerly believed that these calcareous masses were formed in the uterus, and they were termed *uterine calculi*.

There is an admirable specimen preserved in the museum of the Middlesex Hospital; it was described by James M. Arnott* in 1840, and the history of the patient is somewhat remarkable. A maiden lady of seventy-two years was knocked down by a large dog and fell forwards on the pavement. She was seized with severe pain in the belly, and died in thirty-four hours. At the autopsy a circular orifice was found in a coil of ileum which lay between the anterior abdominal wall and a calcified tumour of the uterus. There was extravasation of fæces and intense peritonitis. The tumour, which was as large as a child's head, apparently originated in the anterior wall of the uterus. Several small tumours, also calcified, were attached by pedicles to its capsule.

Arnott's account of the specimen is rendered more valuable by an account of the chemical composition of the mass furnished by Professor Daniell. It contained 56 per cent. of phosphate of lime, with a small quantity of phosphate of magnesia, 35 parts of animal matter, 5 parts of carbonate of lime, and 4 of alkaline sulphates, phosphates, and chlorides.

Similar masses are now and then found in old graves, and are sometimes imagined to be very large urinary calculi.

Subserous myomata are very prone to calcify, and their stalks being thin are apt to break and allow the calcified nodules to tumble into the general peritoneal cavity. These nodules often find their way into all sorts of queer recesses, and sometimes find lodgment in hernial sacs.

* Medico-Chir. Trans. vol. xxiii., p. 199.

Septic Infection.—It occasionally happens that a myoma which has existed for many years and given rise to little or no inconvenience suddenly begins to enlarge rapidly and assumes formidable proportions. This change is often accompanied by high temperature, rapid pulse, and other signs indicative of septicæmia, and almost invariably ends fatally unless the nature of the case is promptly recognised and the tumour removed. These changes are analogous to those which occur in a myoma when it protrudes into the vagina and ulcerates, the infection ending in gangrene.

As far as my observations have extended, septic infection of a uterine myoma, excluding the pedunculated variety, has followed injury inflicted by a uterine sound; changes in the pedicle following oöphorectomy performed for the purpose of anticipating the menopause; and osmosis of fluid and gas from an adherent piece of gut, or a hollow viscus like the bladder.

The appearance of an infected myoma is very striking. On section it looks œdematous and sometimes exhales a sickly odour. Microscopically the muscle cells are separated by multitudes of inflammatory cells, many of which seem to aggregate in colonies, and by appropriate methods micro-organisms may be demonstrated.

The occurrence of septic changes in a myoma of the uterus, and the consequent infiltration of the tissue of the tumour by leucocytes and inflammatory cells, causes sections prepared from it to resemble those obtained from a sarcoma, and there can be little doubt that in many specimens that have been described as "sarcomatous degeneration of a uterine fibroid," the change and appearance and rapid growth of the tumour were the result of septic changes.

There are a few cases recorded by reliable observers in which a myoma has existed in the walls of the uterus for several years, and then, without obvious reason, the tumour has increased rapidly in size, become painful, and disseminated.

In 1883 Dr. Finlay* published a careful account of the case of a woman fifty-nine years old, who had for fifteen years noticed a hard swelling in the lower part of her belly; it had

* Trans. Path. Soc., vol. xxxiv., p. 177. (*See also* Doran, *ibid.*, vol. xli., p. 206.)

not caused her any inconvenience until shortly before she came under Dr. Finlay's observation. She sought advice because the tumour had increased in size and become painful. Peritonitis supervened and she died. I made the post-mortem examination and found a pedunculated myoma as large as a child's head (15 by 11 cm.) attached to the fundus of the uterus; it was adherent to and had penetrated the bladder and intestine. Secondary growths were found at the base of the right lung, on the wall of the left ventricle of the heart, and in the left kidney. The microscopical features of the tumour were characteristic of a myoma and spindle-celled sarcoma; the secondary nodules were identical in structure with the large tumour.

Clinical Features.—The occurrence of uterine myomata before puberty is unknown; these tumours are rarely recognised clinically before the age of twenty-five; from this age they increase in frequency, which attains the maximum between the thirty-fifth and forty-fifth years. Myomata of the uterus are more common in old maids than in married women. This statement is often disputed by gynæcologists who do not frequent the deadhouse. Very many examples of myomata are found post mortem whose presence was not even suspected during life. Of these the purely clinical gynæcologist takes no cognizance. The troubles produced by myomata of the uterus during life vary greatly. As has already been mentioned, many women live years without being aware that they have a tumour. In others the tumour grows slowly and gives no indication of its presence until it is large enough to become impacted, then troubles arise in connection with the bladder, ureters, or rectum; or the tumour is so large as to rise above the brim of the pelvis and produce an obvious enlargement of the belly. Many myomata give few signs of their presence until they protrude through the cervix, and in a fair proportion of cases frequent discharges of blood from the uterus is an important sign. Women will sometimes state that the tumour becomes obviously enlarged immediately before a menstrual period and diminishes as the flow ceases.

Impaction.—An important clinical feature of uterine myomata is their tendency to become impacted in the pelvis

and exercise baneful pressure upon the organs contained therein.

A uterine myoma is said to be impacted when it fits the true pelvis so tightly that the tumour cannot rise upwards into the belly. In many cases the tumour is so firmly held in the pelvis that it cannot be pushed upwards except with the exercise of considerable force, and even this, in some cases, is ineffectual in dislodging it.

Impaction arises from several causes, some of which will be described. It has already been pointed out that uterine myomata, especially those which involve the walls of the uterus uniformly, are very vascular; this vascularity is most marked when they occur in women between thirty-five and forty-five years of age. In such cases uterine myomata, immediately before the onset of a menstrual period, enlarge, and in some examples the increase in size is very obvious. When the myoma is of such a size that during an inter-menstrual period it is easily accommodated in the true pelvis, and perhaps the crown of the cyst is perceptible to the hand when pressed upon the hypogastric region, it will move freely in the pelvis without exerting dangerous or even inconvenient pressure. At the onset of a menstrual period such a tumour will become turgescent and compress the urethra against the pubic symphysis, and cause complete retention of urine, necessitating for a few days the use of the catheter. As the menstrual period declines, the urethra is set free. In such a case the impaction is only temporary, but it recurs with each period, and eventually establishes dilatation of the ureters and pelves of the kidneys (hydronephrosis). In some cases of impaction through menstrual turgescence the urethra may escape, but the ureters will be pressed upon at the pelvic brim.

A myomatous uterus may become impacted even when the tumour it contains is of moderate dimensions. A myoma as large as a fist growing from the posterior uterine wall will cause retroversion of the uterus; the tumour will then lodge in the hollow of the sacrum and dip into the space between the utero-sacral ligaments; in this position it exercises pressure upon the ureters, which leads to hydronephrosis on one or both sides.

Another form of impaction occurs when a number of myomatous nodules spring from the uterus and, becoming wedged under the promontory of the sacrum, prevent the uterus as it increases in size from rising out of the true pelvis.

A myoma which, during the sexual period of life, reaches to the umbilicus, or higher, will sometimes shrink so much after the menopause that it will retire into the pelvis and fit that cavity so completely as to give rise to symptoms of impaction.

Injurious pressure is often exercised by uterine myomata apart from impaction. For instance, a large myoma sometimes occupies the false pelvis, and extends even as high as the ensiform cartilage. Such tumours will weigh many pounds, and, being far too large to enter the true pelvis, will rest upon its brim, and by their weight compress the iliac veins and cause œdema of one or both legs, or press upon the colon and induce obstinate constipation or fatal obstruction, or resting on one or both ureters produce hydronephrosis.

The Rate of Growth.—Few observations have been made as to the average rate of increase of myomata. Matthews Duncan in connection with this matter writes:—"A uterine myoma is not like an apple, attains a certain size, and then ceases to grow. In a life it may grow no bigger than an apple, or it may reach the umbilicus." He also states that a myoma of the size of a fœtal head probably represents a year's growth. It would attain the size of a man's head in three years, and be as large as the uterus at the full time of pregnancy in twelve years. Soft myomata grow quickly, hard tumours grow very slowly; some soft myomata disappear rapidly after the menopause, a few grow rapidly after this event. Hard myomata usually cease to grow after that change; a few shrink somewhat, but the majority remain *in statu quo* and slowly calcify.

Mode of Death from Uterine Myomata.—Although there is no tumour so common in women as a uterine myoma, there is very great difference of opinion as to their influence on the life of the individual. Matthews Duncan writes: "I am sure the fatal number of cases is greater than is generally supposed." This thoughtful man further states: "A woman with an enormous fibroid will not live to be an aged woman."

The chief causes of death are :—

Hæmorrhage.—Copious bleeding leads to death, directly or indirectly, nearly as frequently as post-partum hæmorrhage causes death directly. Often it causes death indirectly by producing extreme anæmia.*

Mechanical Effects.—Pressure on the bowels; pressure on urethra, leading to retention of urine, cystitis, and septic nephritis; pressure on one or both ureters, hindering the flow of urine and inducing hydronephrosis, etc.

Pregnancy in a uterus containing a myoma may terminate happily, but more often it leads to abortion, and seriously imperils the life of the mother. Exceptionally, when a uterine myoma and pregnancy co-exist, the myoma disappears with the involution of the uterus.

Peritonitis.—When a pedunculated myoma becomes gangrenous, the uterine mucous membrane will sometimes necrose, and septic matter finds its way along the Fallopian tubes and fatally infects the peritoneum.

Myomata of the Broad Ligament.—It has already been mentioned that the connective tissue of the broad ligament contains a quantity of plain muscle tissue directly continuous with that which underlies the peritoneal investment of the uterus. This muscle tissue is occasionally the source of myomata. In their early stages broad ligament myomata are of oval shape, encapsuled and, as a rule, bilateral. They do not cause much inconvenience until they attain the size of cocoanuts; even then they can be easily enucleated from between the layers of the ligament. After reaching a certain size they sometimes grow with extraordinary rapidity, and in a few months attain a weight of twenty pounds or more. As these tumours rise out of the pelvis they carry the uterus and its appendages with them, and the relation of this organ to the tumours is indicated in Fig. 73. There is little doubt that the rapid increase in the rate of growth in these myomata is due to septic infection in many cases, and in two that have come under my own observation I have been able to assure myself of the fact, and traced the infection to an adherent coil of intestine in each instance. Coincident with the rapid growth

* Matthews Duncan, "Clinical Lectures," 3rd ed., 1886.

of the tumour the health of the patient suffers, and the pressure it exerts upon the veins at the brim of the pelvis leads to œdema of the lower limbs. This, in conjunction with the

Fig. 73.—Myoma of the broad ligaments. Fallopian tubes; *o*, Ovarias; *u*, Uterus; *c*, Cysts.

serious depreciation of the patient's health, has led a few surgeons to regard these tumours as rapidly-growing spindle-celled sarcomata.

In some cases the tumour will raise the anterior layer of the broad ligament and extend along the subperitoneal tissue so as to lie between the peritoneum and the anterior abdominal wall, reaching the level of the navel.

The tumour most likely to be confounded with a broad ligament myoma would be a myoma growing from the side of the uterus and pushing its way between the layers of the ligament.

This description of broad ligament, or mesometric myomata is founded upon a study of eleven cases. All occurred in women over thirty-five years of age. Three of the tumours equalled cocoa-nuts, one was as big as an average fist, the remainder were large masses weighing upwards of sixteen pounds. These specimens contained calcified tracts: the softer parts were succulent, like the pulp of an orange, and yielded a yellow, tenacious, highly albuminous fluid; actual cavities were present in some of the specimens, and in three gangrenous patches existed.

Myomata of the Round Ligament of the Uterus.—This ligament, like the ovarian ligament, is practically a process of the muscular tissue of the uterus. A part of the round ligament lies in the pelvis under cover of the anterior layer of the broad ligament; the terminal third traverses the inguinal canal. Oval tumours composed of smooth muscle-fibre mixed with fibrous tissue have been observed in connection with the intra- and extra-pelvic segments of this ligament.

Matthews Duncan* described a tumour of the size and shape of a hen's egg; it lay quite free in front of the right broad ligament; the round ligament, which could be traced to the surface of the tumour, ended in its capsule. The structure of the tumour was that of a dense fibroid, with numerous cretaceous points near its centre.

Fibro-myomata of the section of the ligament traversing the inguinal canal have been several times observed; they are oval in shape, and sometimes reach the size of cocoa-nuts.†

Myomata of the Ovary and its Ligament.—Tumours of the ovary composed of muscle fibre or a mixture of muscle and fibrous tissue are very rare. Ovarian myomata may attain

* Trans. Obstet. Soc., Edin., vol. iv., 195.

† Spencer Wells, Trans. Path. Soc., vol. xvii. 188.

large proportions, and specimens have been recorded weighing fifteen pounds. These tumours in their minute structure resemble uterine myomata, but they are not so liable to the secondary changes which affect similar tumours of the uterus or broad ligament.

Myomata are rarer in the ovarian ligament than in the ovary; usually they are very small: the largest specimen which has come under my notice was no bigger than a child's fist. It projected on the posterior aspect of the broad ligament, and resembled an enlarged ovary.

Myomata of the Fallopian Tube.—A myoma of the Fallopian tube is an excessively rare tumour—so rare, indeed,

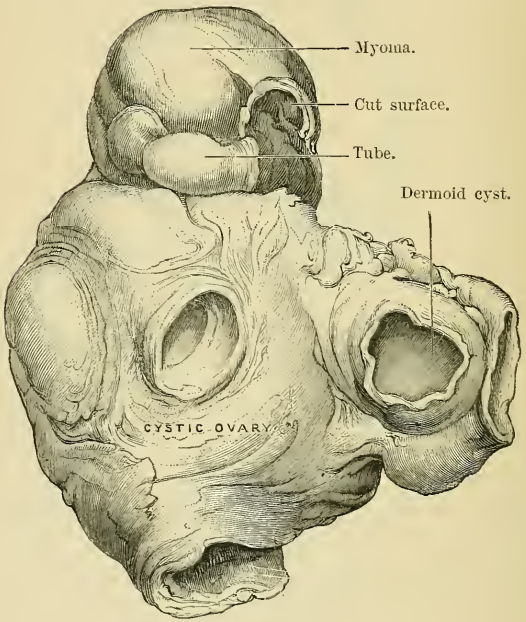

Fig. 74.—Myoma of the Fallopian tube.

that my experience is limited to one specimen: this occurred in a woman twenty-nine years of age in association with an ovarian dermoid. (Fig. 74.)

The myoma in this instance was of the size and shape of a Tangerine orange; it involved the whole thickness of the tube, and a narrow channel lined with mucous membrane traversed

the centre of the tumour, and a segment of tube, 2 cm. in length, intervened between it and the angle of the uterus. To the naked eye the tumour presented all the characters of a uterine myoma, and under the microscope it was found to consist of typical smooth muscle cells.

Myomata of the Alimentary Canal.—Hilton Fagge* met with a myoma in the **œsophagus** in a man thirty-eight years of age. It grew in the anterior wall of the gullet just below the level of the bifurcation of the trachea. The tumour was ovoid, and measured 5 cm. in its long and about 3 cm. in its short axis. The surface in relation with the mucous coat was smooth and rounded, but that in contact with the muscular coat was somewhat nodulated and inseparably adherent to the longitudinal muscle fibres of the œsophagus. On section the tumour had the colour and general appearance of a myoma of the uterus, and microscopically consisted of unstriped muscle-fibre. It caused no symptoms during life.

Virchow † refers to a specimen which he found at the cardiac end of the œsophagus; it was a spherical tumour 1 cm. in diameter, situated in the submucous tissue, but was connected with the muscular coat of the gullet.

Virchow also mentions that myomata are more frequent in the **stomach** than in other parts of the intestinal tract, and is of opinion that gastric myomata are frequently confounded with cancers, fibromata, and even with cysts. They may assume the form and size of a cherry, a haricot, or an almond, but sometimes greatly exceed these dimensions.

Dr. Wesener ‡ found a myoma as large as a plum, growing from the wall of the **duodenum** 15 cm. below the pylorus. The patient was a man fifty-five years of age. The symptoms were those characteristic of malignant disease of the pylorus—viz., vomiting, emaciation, and dilatation of the stomach. No tumour was perceived during life; it projected into the lumen of the gut, and its surface was slightly ulcerated.

Myoma of the Bladder.—Gibbons and Parker § have

* Trans. Path. Soc., vol. xxvi., p. 94.

† "Die Krankheiten Geschwülste," bd. iii. 126; and Kidd, Trans. Path. Soc., vol. xxxv. 196.

‡ Virchow's "Archiv," bd. xciii. 377.

§ Trans. Clin. Soc., vol. xxi. 58.

recorded the details of a myoma which they successfully removed from the bladder of a girl eighteen years of age. A good drawing accompanies the description, showing the histological features of the tumour.

Cutaneous Myomata.—Myomata arise in connection with the skin. I once removed from the scrotum of a boy a few months old a rounded firm tumour with a diameter of 1 cm. On section it had a yellowish tint, and when submitted to the microscope was found to be made up of unstriped muscle fibre.

Dr. Serg. Marc* met with a myoma on the occiput of a female child three weeks old (Fig. 75). The tumour was noticed

Fig. 75.—Congenital subcutaneous myoma of the occiput. (*After Marc.*)

at birth. When it came under observation at the Prince Peter von Oldenburg Hospital, St. Petersburg, it had a diameter of 3·5 cm. at the base; the skin covering it was slightly pigmented, and the summit of the tumour was sparsely covered with lanugo-like hair, but around its base the hair was abundant. The tumour was firm to the touch, and manipulation caused no pain; when removed it was found to be encapsuled, and on microscopical examination exhibited the characters of a myoma. The histological details are described with great care.

Treatment.—It is by no means an easy task to frame rules for the treatment of uterine myomata. It is quite certain that if these tumours could be removed with the same ease

* Virchow's "Archiv," bd. cxxv. 543.

and safety as ovarian tumours, this would be the proper course; but until surgeons find some safer and simpler methods than those at present practised, hysterectomy for uterine myomata will only be employed for tumours which directly threaten life.

It has been for many years the custom to remove the pedunculated submucous myoma which is known as a uterine polypus; many of these possess narrow stalks, which simply require detaching with very little more ceremony than a gardener detaches a ripe pear. Others have broad bases and require enucleation—a troublesome and often dangerous process which is being gradually abandoned in favour of hysterectomy.

The removal of a uterus containing a large myoma through an incision in the abdominal wall is a serious proceeding, but fortunately there is an alternative which is often as useful as hysterectomy, but far less dangerous. It has already been mentioned that some myomata shrink and ultimately disappear, and many others cease to grow after the menopause. Taking advantage of this fact, surgeons often artificially accelerate the menopause by removing the ovaries and Fallopian tubes (oöphorectomy).

This operation has now been carried out in a large number of cases with admirable results, and its effect in causing the disappearance of tumours reaching even to the umbilicus is often astonishing, and the rapidity of the shrinking is equally remarkable. Unfortunately this method is not applicable to all cases, for in many the tubes and ovaries are sometimes so implicated in the tumour, or crowded into inaccessible positions, that they cannot be removed, and if the least piece of ovarian tissue is allowed to remain it will nullify the operation; in the case of large tumours the broad ligaments are so stretched that the ligatures slip from the pedicles. Often the ovary on one side can be removed, but not on the other; hence many operations undertaken with the view of oöphorectomy terminate in hysterectomy. It is for this reason that uterine myomata are not, as a rule, subjected to surgical treatment unless they threaten life directly or indirectly.

The practice generally adopted may be summarised thus:—

1. A myoma is the cause of serious and repeated hæmorrhage producing profound anæmia; the bleeding is uninfluenced by rest and the administration of ergot.

These signs may be due to a pedunculated myoma; this should be removed without delay. When the tumour is small it may be, and often is, necessary to dilate the cervical canal. When no such cause exists and the menopause cannot be expected for some years, then oöphorectomy should be carried out, and, failing this, hysterectomy, if the anatomical conditions be favourable.

2. A myoma of moderate size, in a woman between thirty and forty-five years, becomes impacted so as to cause retention of urine at each menstrual epoch.

Such a case demands oöphorectomy, which is usually an easy and safe proceeding in these circumstances. The operation is advised to prevent the kidneys becoming hydronephrotic.

The following conditions demand hysterectomy :—

1. A myoma rapidly increasing in size and extending high above the pelvic brim causes intestinal obstruction by pressing on the colon at the brim of the pelvis.
2. A myoma that rapidly enlarges after the menopause; such a tumour is a rarity, but it is a reality.
3. A myoma that has given little trouble suddenly begins to enlarge, accompanied by rapid pulse, high temperature, and signs of septicæmia; this indicates septic infection of the tumour.

It occasionally happens that an operator opens an abdomen under the impression that he is dealing with an ovarian tumour. In such circumstances it is his duty to perform oöphorectomy if practicable. Sometimes large subserous pedunculated myomata simulate ovarian tumours; such may be easily dealt with by tying the pedicles and cutting away the tumours.

Myomata of the Broad Ligament.—Large tumours of the kind represented in Fig. 73 have in many instances been enucleated. The operation is very tedious, difficult, and dangerous; more than half the patients die.

Myomata of the Round Ligament.—The removal of these tumours is devoid of risk.

Ovarian Myomata.—These are treated on the same principles as ovarian cysts and with the same happy results.

Cutaneous Myomata.—These are as easily removed and with as little inconvenience as fatty tumours.

CHAPTER XVI.

NEUROMATA.

A **neuroma** is a tumour growing from, and in structure resembling, the sheath of a nerve. The genus neuroma contains three species :—

1. Neuro-fibroma.
2. Plexiform neuroma.
3. Traumatic neuroma.

1. **Neuro-fibromata.**—A neuroma of this species is usually fusiform, and grows from the side of a nerve. When large it will spread out the fasciculi of the nerve like a strap: exceptionally the nerve will traverse the neuroma. As a rule, the long axis of the tumour coincides with that of the nerve from which it grows.

In size, neuro-fibromata vary greatly : some are no larger than lentils, others may attain the size of a fist : larger specimens are exceptional : they are often multiple, and sometimes affect the nerves in almost every part of the trunk and limbs : in other cases they may be localised to the nerves of a limb, or even limited to one nerve.

Simple neuromata occur on the cranial as well as on the spinal nerves, and grow on the roots, trunks, or terminal branches ; they form smooth swellings, which are mobile, and, when situated in the subcutaneous tissue, glide easily under the skin.

Structurally neuro-fibromata consist of connective tissue identical with that which constitutes the sheath of the nerve ; they are extremely liable to become myxomatous, and in large specimens this change may lead to the formation of cavities in the tumours. These changes account for the various names applied to neuromata—such as myxoma, myxo-fibroma, myxo-sarcoma, neuro-myxoma, and the like.

An instance of a neuroma consisting almost entirely of myxomatous tissue is represented nearly natural size in Fig. 76. The tumour grew from the infra-orbital nerve and invaded the antrum. The surface of the tumour which projected into the antrum was covered with a layer of mucous membrane

furnished with ciliated epithelium. In this case the tumour produced intense suffering.*

The branches of the fifth cranial nerve (trigeminal) are often the seat of neuromata, and in the majority of cases they cause great pain. It is a curious fact that a neuroma on a mixed nerve is rarely painful. The tumour of the radial nerve (Fig. 77) was painless except when pressed.

Neuromata form on any of the cerebro-spinal nerves, but they affect some of the cranial nerves much more frequently than others. Sensory nerves seem more liable to be attacked

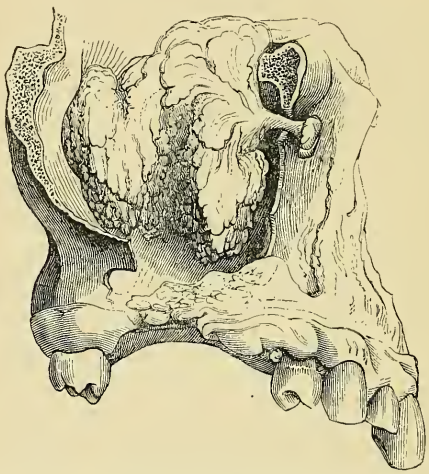

Fig. 76.—Neuroma of the infra-orbital nerve invading the antrum. The patient was a woman twenty-two years of age.

than those that are purely motor. Mention has already been made of the frequency with which the branches of the trigeminal nerve (fifth) are attacked by neuromata, and it is somewhat strange that the facial nerve (seventh), which supplies an almost identical territory, should so rarely develop tumours on its sheath. Hutchinson† has described a neuroma removed from the facial nerve as it traversed the parotid gland by Warren Tay.

A neuroma of the **optic nerve** is a great rarity. Jocqs‡ has written a valuable monograph based on the records of sixty-two cases. The clinical facts contained in the book are

* Trans. Clin. Soc., vol. xxiii. 44.

† Trans. Path. Soc., vol. xxxvii. 459.

‡ "Des Tumeurs du Nerf Optique," Paris, 1887.

extremely useful, but there is little definite pathological information. The tumours are classed mainly under five heads —glioma, myxoma, myxo-sarcoma, fibroma and sarcoma. The tumours of this nerve occur at any age, but they are very rare after the twentieth year. Most of them are myxomatous. Those that occur in infants and in old age are probably sarcomata. There can be little doubt that the rarity of tumours of the optic nerve explains the want of accurate histological

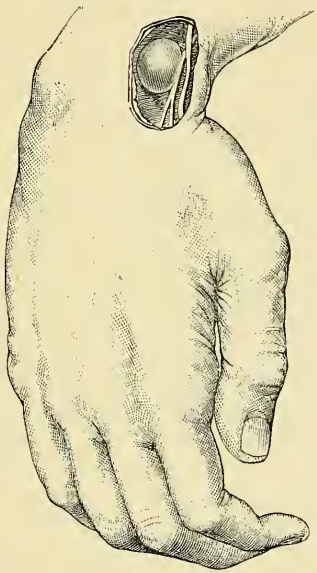

Fig. 77.—Neuro-fibroma of the radial nerve at the wrist, from a female nineteen years old. It simulated a ganglion.

knowledge concerning them, as many ophthalmic surgeons of very large experience do not see more than one case in a lifetime. Tumours of the optic nerve are usually ovoid in shape, with their long axes coincident with those of the nerve. Their surfaces are usually smooth, and in size they vary greatly, but rarely exceed a pigeon's egg. They do not tend to invade the globe, but they are apt to creep through the optic foramen and involve the intracranial portion of the nerve. As the fibres of the nerve are early implicated, vision is soon interfered with; there is proptosis, but the movements of the eye are free, and there is no pain, even on manipulation.

Neuromata have been observed on the **auditory nerve**

within the internal auditory meatus. Toynbee* has recorded some examples. In each instance the patients suffered from slowly increasing deafness.

Neuromata occur on the **roots** of the spinal nerves. When large, a neuroma in this situation may so press upon the cord as to induce paraplegia. Mr. Sibley† recorded an example of this in 1866. A man forty-five years of age was admitted into the Middlesex Hospital with well-marked paraplegia. At the post-mortem examination a large number of small tumours was found on the roots of the nerves. Many of the roots were so beset with these tumours as to resemble strings of beads. In the cervical region there was a tumour as large as a nut, which had compressed the cord and produced paraplegia. There was a large neuroma on the anterior crural nerve, and smaller examples on the branches of the lumbar plexus. Chavasse‡ has recorded a somewhat similar case. In this instance a large neuroma springing from a cervical nerve formed a tumour in the neck; this was removed; septic spinal meningitis followed, ending in death.

Multiple neuromata are sometimes associated with a multitude of the small tumours of the skin known as **molluscum fibrosum**. We are indebted to Professor von Recklinghausen§ for formulating our knowledge in regard to this combination.

In typical cases of molluscum fibrosum the skin of the trunk and limbs presents numbers of small tumours, consisting mainly of fibrous tissue springing from the subcutaneous connective tissue. These tumours are of various sizes, some being no larger than a pin's head, whilst many are as big as a filbert, and a few even larger. The majority are about the size of a small pea. Many are sessile, and others are distinctly pedunculated, but all are covered with skin. These tumours are mobile, soft to the touch, and of the consistence of fat. The general appearance and distribution of these molluscum bodies are shown in Plate III.

* Trans. Path. Soc., vol. iii. 49; and iv. 259, plate ix., fig. 1.

† Medico-Chir. Trans., vol. xlix. 39.

‡ Medico-Chir. Trans., vol. lxix. 517.

§ "Die multiplen Fibrome der Haut und ihre Beziehung zu den multiplen Neuromen," Berlin, 1882.

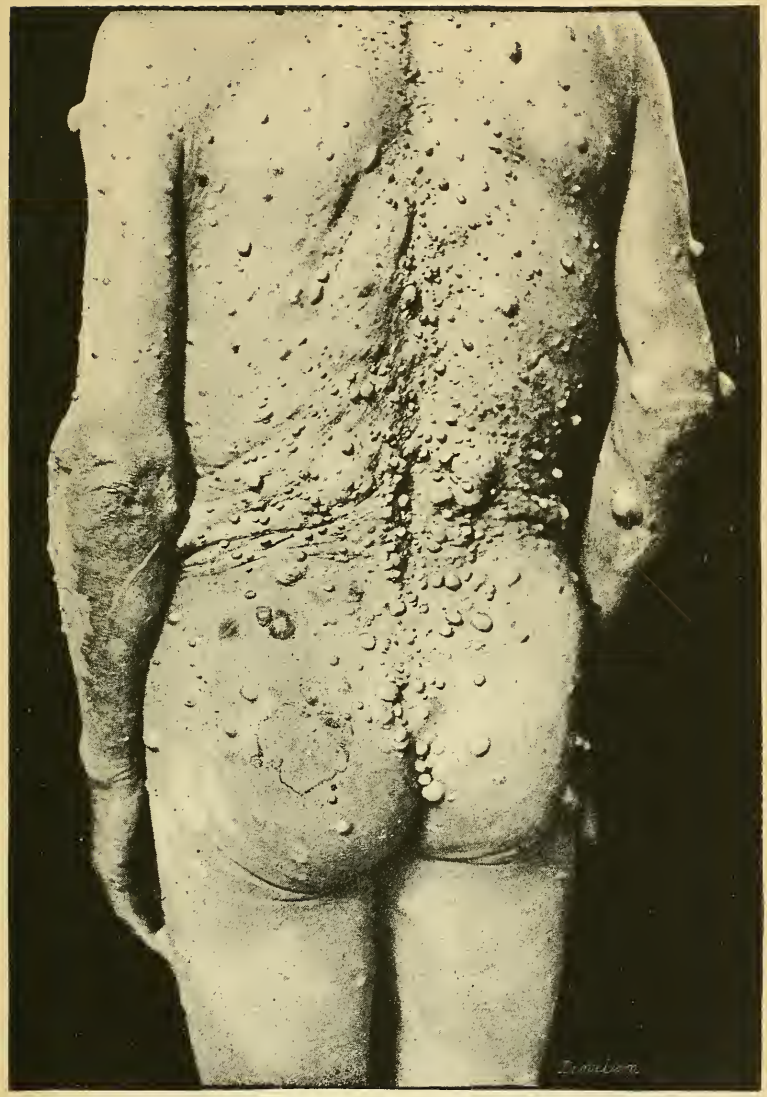

PLATE III.—Molluscum Fibrosum combined with Tumours on the Nerves.
(*After Payne.*)

Prof. von Recklinghausen was the first clearly to detect the association of the two classes of tumours, and he urged that the molluscum bodies of the skin were formed on the cutaneous nerves, and were as truly neuromata as the fibrous tumours on the epineurium of the deeper nerves.

It has been argued against this view, especially by Dr. Payne,* that some of the molluscum bodies contain no nerve fibrils, but appear to be formed around other structures of the skin, such as glands and hair follicles.

It should be borne in mind that in the common form of subcutaneous neuroma, the *painful subcutaneous tubercle*, no one has yet succeeded in demonstrating the presence of nerve fibrils. (*See* page 50.)

The remarkable case of Michael Lawlor, described in Smith's classical monograph,† was, in all probability, an example of this combination. It was estimated that this man had at least 2,000 tumours. There were 450 tumours counted on the nerves of the right lower limb, and 300 on the left. There were 200 tumours on the right and 100 on the left upper limb. The pneumogastric nerves and their branches possessed 60 tumours, some of large size. The remainder were on the trunk.

2. **Plexiform Neuromata.**—This species of neuroma is, in comparison with the preceding, somewhat rare. Instead of forming distinct tumours, as is the case with simple neuromata, it seems as if the branches of a nerve distributed to a particular area of the skin become enlarged and elongated. The result is that the skin overlying them becomes stretched, thinned, and raised over the thickened nerves.

When the tumour is examined it feels like a loose bag containing a number of tortuous, irregular vermiform bodies, soft to the touch and mobile: they vary in thickness from a crow-quill to that of the thumb; manipulation produces no pain. When the skin covering the tumour is reflected these elongated bodies will be found to lie in the direction of the nerve of the part; thus on the scalp they will run towards the vertex; on the back their direction will be transverse, and so on.

* Trans. Clin. Soc., vol. xxii., p. 189; and Trans. Path. Soc., vol. xxxviii., 69.

† "Neuroma," 1849.

On section the nerve has an appearance like an umbilical cord, due to the presence of a large quantity of myxomatous tissue replacing the sheath of the nerve.

Plexiform neuromata are, as a rule, congenital; in the case

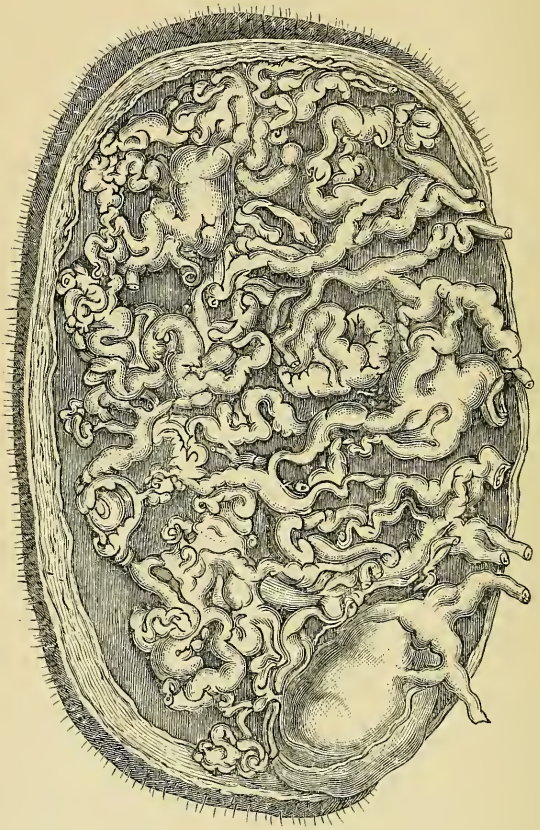

Fig. 78.—Plexiform neuroma from the back of a youth nineteen years of age. (*After Bruns.**)

represented in Fig. 78 the skin covering the tumour was the seat of a brown mother-mark.

Campbell de Morgan published the details of a remarkable plexiform neuroma implicating the musculo-spiral nerve and its branches in the forearm. The patient, a young lady, had

* *Beiträge*, bd. viii., s. i.

an irregular swelling extending from the palm of the hand to the elbow. (Fig. 79.) This swelling felt like strings of beads; it was not painful except when pressed. The patient was under observation seven years, and as the tumour continued to increase, the arm was amputated.

On dissection the musculo-spiral nerve was found to be as thick as the thumb; it looked gelatinous, like an umbilical cord, and as it passed under cover of the brachio-radialis muscle it entered a neuroma as large as an egg. The radial and cutaneous branches issued from this tumour as thick, irregularly nodulated trunks. (Fig. 80.)

Malignant Neuromata.—Although the majority of tumours

Fig. 79.—Arm in which the musculo-spiral nerve was neuromatous.
(*After Campbell de Morgan.*)

which originate in the connective-tissue sheaths of nerves are either fibromata or myxomata, yet now and then tumours arise from nerve-trunks which in their clinical behaviour, as well as in structure, are sarcomata, and, as a rule, belong to the spindle-celled species; such tumours are sometimes called malignant neuromata. Balding* has given an account of a case in which he removed a tumour of this kind from the great sciatic nerve of a man thirty years old; it quickly returned, general dissemination followed, and the man died.

Lawson † has published an example of a round-celled sarcoma springing from the sheath of the optic nerve in a man sixty-five years of age. The eye and nerve were excised: there was recurrence and death in three months.

* Trans. Path. Soc., vols. xxvii. and xxviii. 23.
† Ophth. Hosp. Rep., Lond., 1882, p. 296.

3. **Traumatic Neuromata.**—After a nerve has been divided, the proximal end becomes enlarged and forms an oval bulb. A drawing made from a dissection of the stump left after

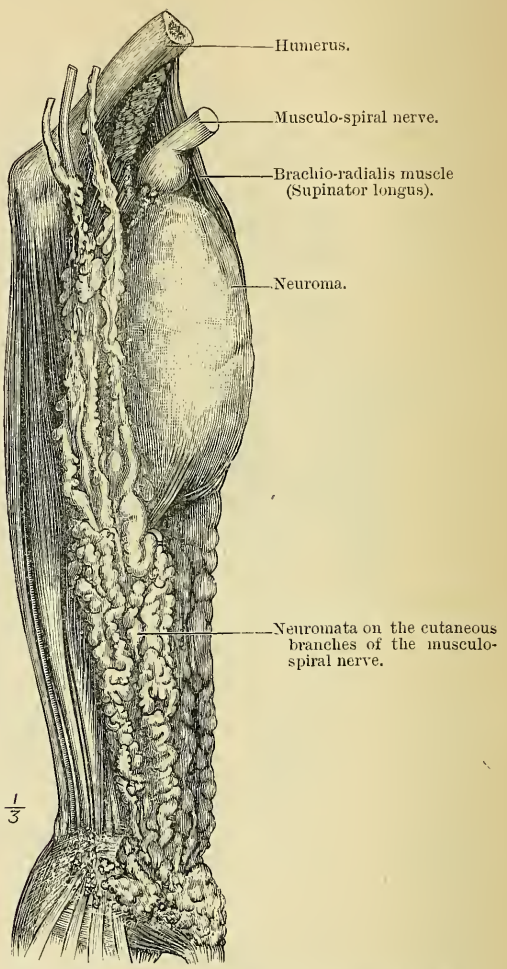

Fig. 80.—The arm represented in the preceding figure dissected; the musculo-spiral nerve and its branches are transformed into a plexiform neuroma. (*Museum, Middlesex Hospital.*)

amputation through the forearm, three years previously, is shown in Fig. 81. The median, musculo-spiral, and ulnar nerves terminate in bulbs.

These curious bulbs are nearly always found in amputation

stumps. In size they bear little relation to the nerves on which they occur, for a bulb on the cut end of a saphena nerve may in some cases be as large as one on the cut end of the external popliteal in the same stump. The bulbs form rapidly, and will sometimes attain the size of a cherry-stone on a cut ulnar nerve in the space of six weeks. Recently-formed bulbs consist of connective tissue intermixed with nerve fibres in various stages of degeneration, but old examples rarely contain nerve fibrils, and are often as dense as cicatricial tissue.

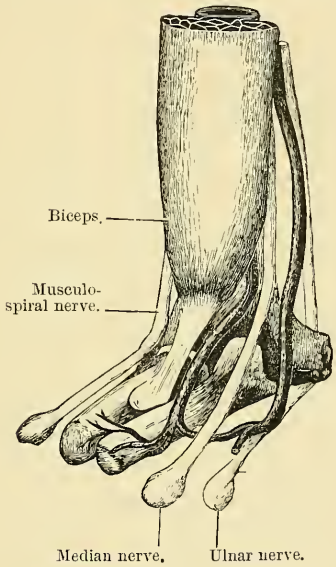

Fig. 81.—Dissection of a stump of the forearm three years after amputation, to show the bulbs on the ends of nerves. (*Museum, Middlesex Hospital.*)

There is reason to believe that bulbs are larger in cases where suppuration has been profuse and healing long delayed; also when the nerves have become adherent to bone or incorporated in the cicatrix. In many examples it is probable that the end of the nerve has been included in a ligature applied to an artery.

The size of the bulb has little influence on the pain felt in a stump. In some instances, where pain is so intense as to necessitate re-amputation, only small bulbs exist. In the case of the stump represented in Fig. 81 even firm pressure on

the bulbs failed to produce evidence of pain. Stumps are more often troublesome from this cause in females than in males.

Similar bulbs occur in other mammals and birds after the accidental ablation of limbs by traps, guns, or bites from other animals. These bulbs are sometimes painful when pressed, particularly on the stumps of the tails of dogs that have been docked. Bulbs form on the proximal ends of divided nerves independently of amputation, as dissections of the nerves in the legs of horses that have been submitted to neurotomy demonstrate. When nerves are injured by brittle substances, such as glass, slate, and the like, small fragments sometimes become embedded in the nerve and cause excessively painful bulbs to form.

Clinical Features.—Neuromata are, in the majority of cases, innocent tumours; they very rarely recur or become disseminated; nevertheless they are in exceptional cases the cause of death. A large intracranial neuroma will produce fatal pressure on the brain, and several cases are recorded in which small neuromata of the spinal nerve roots have caused paraplegia and death. Smith* refers to a case in which a woman complained of severe pain in the course of the right trigeminal nerve; this pain was so much increased by mastication that she ate but little, and speaking aggravated it to such a degree that she always remained silent unless interrogated, and even on these occasions she frequently replied by signs. She died after enduring severe and uninterrupted pain during four and a half months. At the autopsy a neuroma as large as a walnut occupied the situation of the right Gasserian ganglion.

The pain produced by pressing a painful subcutaneous tubercle has already been considered. When the roots of the spinal nerves are involved in a neuroma, pain is a prominent symptom, but is not confined to this class of tumour.

Treatment.—A solitary neuroma in an accessible position is easily removed. When seated upon a large nerve trunk, especially if it contain motor fibres, care must be exercised to avoid damage to the nerve. In many cases the tumour can be separated without injury to the nerve; it occasionally

* "Neuroma," p. 120.

happens that the neuromatous nature of the tumour is not recognised until after its removal with a portion of the nerve. In the limbs such breaches in the continuity of nerves have been repaired by grafting fragments of nerves from amputated limbs or from rabbits; it is, however, always better to avoid the accident by careful surgery than to remedy it by secondary measures, however brilliant. Persistent facial palsy has followed removal of a neuroma lodged in the parotid gland. Neuromata within the spinal canal have been successfully removed. A neuroma of the optic nerve usually necessitates excision of the eyeball.

Multiple neuromata, and especially those associated with molluscum fibrosum, are beyond the reach of surgical art.

Plexiform neuromata have been several times successfully removed; exceptionally, when affecting the nerves of a limb, amputation has been necessary.

Traumatic neuromata, when painful in an amputation stump, are best treated by removal. When an important limb nerve has been divided, its union is brought about by joining the cut ends with sutures. Often the injury to the nerve is overlooked until the wound is cicatrising: it is then necessary to expose the gap in the nerve and vivify the ends of the nerve and unite them with suture. When the gap is very extensive, nerve-grafts may be requisite to effect the repair. Wörner* has published the records of a case in which, after a gunshot wound of the head, without injury to the bone or brain, a traumatic or scar-neuroma (narben-neurom) formed on the occipital nerve. The patient afterwards suffered for years from epileptiform seizures. The neuroma, which was as large as a pea, was excised, and the fits stopped.

Ganglionic Neuroma.—Tumours sometimes occur in the brain composed of ganglion cells, nerve fibrils, and neuroglia.

Klebs† describes a neuroma of this species which grew from the floor of the fourth ventricle near the calamus scriptorius; the tumour was nearly as large as a walnut. He gives two good drawings to illustrate its histological characters. Possibly some brain tumours described as gliomata were ganglionic neuromata.

* Bruns, *Beiträge*, bd. i. 506.

† Allgemeine Pathologische Morphologie, bd. ii. 795, 1889.

CHAPTER XVII.

ANGEIOMATA.

An **angeioma** is a tumour composed of an abnormal formation of blood-vessels.

This genus contains three species:—1, Simple nævus; 2, cavernous nævus; 3, plexiform angeioma.

1. **Simple Nævus.**—This is the most common species of nævus, and in its typical form affects the skin and subcutaneous tissue. There are three varieties. A nævus may appear as a superficial discolouration of the skin, and is either a lively pink or a deep blue: these are known as "port-wine stains." Such nævi may involve an area of skin 2 cm. square, or extend over a large portion of the face, or half the trunk, or be restricted to a limb.

A very frequent form of nævus is that often referred to as *teleangeiectasis;* it consists of an abnormal collection of arterioles situated in the skin and subcutaneous tissue; it may be present at birth, but much more frequently appears in the course of the first few weeks of life. Sometimes a nævus appears as a red spot no larger than a split pea, then suddenly it grows actively, and in two or three months will involve an area of skin 4 cm. square. When the nævus consists of arterioles it will be of a bright pink colour; when composed mainly of venules it will be of a bluish tint. Lymphatics are often present. Structurally nævi are composed of minute blood-vessels embedded in fat; usually two or more large vessels establish a communication between the nævus and an adjacent artery or vein. The vessels of the nævus are often sacculated. When gently compressed, the blood is driven from the nævus, which at once loses its colour, but the colour returns as soon as the pressure is relieved.

Simple nævi are common enough in the skin of the face, scalp, neck, and back. They are less frequent on the limbs. They also occur on the labium, the lips, tongue, and conjunctiva.

Nævi of small size frequently disappear spontaneously;

more often they gradually increase in size, and many become converted into cavernous nævi.

2. **Cavernous Nævus.**—This is the variety to which the term erectile tumour is in all fairness applicable. In structure it is comparable to the spongy tissue characteristic of the cavernous and spongy bodies of the penis. Cavernous, like simple nævi, are most frequently seen in connection with the skin, where they form distinct tumours of a red or blue colour, rising above the general surface; sometimes they display the peculiar tint so characteristic of fluid contained in thin-walled cysts, for which a cavernous nævus is often mistaken, especially when situated near the outer angle of the orbit. In most cases the blood can by firm and steady pressure be squeezed out of a nævus, but the swelling quickly reappears after the compression is removed. The surface of a nævus may be over-warm, and sometimes the tumour pulsates, the movement being appreciable to the finger, and occasionally perceptible to the eye.

Structurally, cavernous nævi are made up of variously-shaped spaces and sinuses, the walls of which are merely fibrous septa, lined with endothelium. Some of these nævi consist in part of vessels and in part of cavernous spaces. When an angeioma consists entirely of irregular blood-containing spaces a dissection around its periphery will reveal the existence of vessels, sometimes of considerable size, conveying blood to it from adjacent arteries. Cavernous, like simple nævi, are, as a rule, congenital, but a nævus which during infancy is small and inconspicuous may later in life become converted into a cavernous nævus of large size, and one that will, under certain conditions, jeopardise life. A good example of this came under my care in a lad seventeen years of age. It appeared that as a child he had an ordinary nævus of small size in the skin above the left nipple. For many years this gave no trouble, then gradually increased in size until the **mamma** was converted into a cavernous nævus 8 cm. in diameter. At intervals the surface ulcerated, and profuse hæmorrhages were the consequence; these greatly reduced the boy's health, and rendered him profoundly anæmic.* I successfully excised the tumour. Nævi of the mammæ

* Trans. Clin. Soc., vol. xxii., 187

of children or adults are very rare.* An extraordinary case illustrating the size to which a cavernous nævus of the breast may attain, and its dangers, is that reported by Image.†

Cavernous nævi occasionally occur in the **tongue**; as a rule they are situated near the surface, and form slightly elevated patches of a deep blue, or livid colour. Such nævi rarely give rise to any difficulty in diagnosis, their colour, general appearance, and the fact that firm pressure suffices to drive the blood out of the tumour are sufficient to indicate their nævoid character. Many lingual nævi are congenital, but a fair proportion originate late in life. It must also be borne in mind that a small and inconspicuous nævus may, as years run on, develop almost silently into a dangerous erectile tumour. When a cavernous nævus is situated deeply in the substance of the tongue its recognition may be difficult and, before operation, almost impossible.

In some instances lingual nævi cause very little inconvenience unless they bleed, and this accident may arise at any time, either by abrasion from hard food or from accidental bites, or in consequence of rubbing against jagged teeth. Under such conditions the hæmorrhage is sometimes very alarming, and so oft-repeated that it is in some instances imperative to excise the implicated half of the tongue. Except in the tongue and rectum,‡ cavernous nævi are very rare in mucous membranes.

Cavernous angeiomata are sometimes found in **voluntary muscles**. Several interesting examples were collected and described by Campbell de Morgan § in 1864. A case under his care occurred in the semi-membranosus of a girl ten years old: the tumour had been noticed at birth, but as it increased in size it was removed. The child recovered. The histology of the tumour was carefully investigated by Hulke, who found it to exhibit a characteristic cavernous structure. This specimen and others considered in de Morgan's paper are preserved in the museum of the Middlesex Hospital.

A cavernous nævus from the semi-tendinosus muscle is

* Bryant, "Diseases of the Breast," p. 345.

† Med.-Chir. Trans., vol. xxx., 105.

‡ Barker, Med.-Chir. Trans., vol. lxvi., 229.

§ *Brit. and For. Med.-Chir. Review*, 1864, p. 187.

preserved in the museum of St. Bartholomew's Hospital. Holmes Coote excised one from the deltoid of a little girl; in this instance the swelling was congenital.

Liston* removed an erectile tumour from the popliteal space of a boy ten years of age. At the operation it seemed to be closely associated with the semi-membranosus muscle. Attention was first attracted to the tumour when the child was two years old; during the succeeding eight years it slowly but gradually increased in size. At the age of three years the tumour distinctly pulsated, and was as large as a turkey's egg.

Cavernous angeiomata are of very rare occurrence in the **larnyx**; nevertheless they have been observed in this situation, and the careful descriptions of some of the cases place the nature of the tumour beyond doubt. They have been observed springing from the vocal cords,† the ventricular bands, and from the ventricle. The most striking examples arise in the sinus pyriformis.

Usually such tumours are sessile, but are occasionally pedunculated; they may be bright red or purple in colour. The surface of the tumour may be smooth or nodulated like a mulberry; they are rarely larger than a haricot bean. The colour of the tumour is its most striking clinical feature.

An extremely rare situation for a cavernous nævus is the **subperitoneal** tissue. Lane‡ has described an extraordinary example.

The **liver** is not an uncommon situation for cavernous nævi of small size. Nævi are not uncommon in the livers of cats and feline mammals in general, but they appear to be harmless tumours.

There is reason to believe that cavernous nævi sometimes undergo degenerate changes and become converted into cysts. (*See* Chapter on Nævoid and Lymphatic Cysts.)

3. **Plexiform Angeiomata.**—The species of angeiomata which will be included under this denomination are those usually designated as "aneurisms by anastomosis" or "cirsoid aneurisms." The former term appears to have been introduced by John Bell, but the expression "aneurism by anastomosis"

* Med.-Chir. Trans., vol. xxvi., p. 120.

† Percy Kidd, Trans. Clin. Soc., Lond., vol. xxv., 307.

‡ Trans. Clin. Soc., vol. xxvi.

has come to be used so vaguely that its suppression is a matter of necessity.

A plexiform angeioma consists of a number of abnormal blood-vessels of moderate size arranged parallel to each other, as in the rete mirabile of the fore-limb of the sloth, or the tail of a spider monkey. Such angeiomata may consist of arteries only, as in arterial retia, or of veins, or of arteries and veins in equal proportions as in duplex retia. In some the vessels are very tortuous, a disposition is more common with arteries than veins. Tortuous vessels are not infrequent in retia—for example, the arterial retia in the intercostal spaces beneath the pleura of cetaceans, and in the pituitary fossæ of oxen and sheep, and renal glomeruli.

Plexiform angeiomata are very rare; the largest that has come under my notice occurred in the perineum of a lad nineteen years of age; the corpus spongiosum was surrounded by a number of arteries as large as the coronary branches of the facial, and veins as big as the cephalic. The arrangement resembled that of a duplex rete.

Barwell* has given a very careful clinical history, accompanied by a description of the dissection of the limb, in which a plexiform angeioma involved the arteries and veins in the forearm of a man twenty-one years of age. In this case the superficial veins and the muscular branches of the arteries were more particularly involved.

Müller† has recorded very carefully the clinical history and an account of the subsequent dissection of a very unusual example of plexiform angeioma. The patient, a man of twenty years, stated that his parents noticed a red spot on the left half of the forehead when he was a year old; this gradually increased in size, and at the age of twelve it had become an obvious tumour. When the patient was sixteen it not only grew rapidly, but began to "buzz." At the age of twenty the tumour exhibited all the characters of a plexiform angeioma, the pulsation being attended by a whirring sound. There was obvious hypertrophy of the left ventricle of the heart.

P. Bruns ligatured the right external carotid and the left common and external carotid. The patient became

* Trans. Path. Soc., vol. xxxviii., p. 121.

† Bruns, *Beiträge*, bd. viii. 79.

hemiplegic on the second, and died on the third day after the operation. Death was due to embolism and thrombosis of the left middle cerebral artery. The parts were injected and dissected. As shown in Fig. 82, the angular arteries were of colossal size and very tortuous.

Treatment.—This varies with the character of the angeioma; for instance, the diffuse species known as "port-

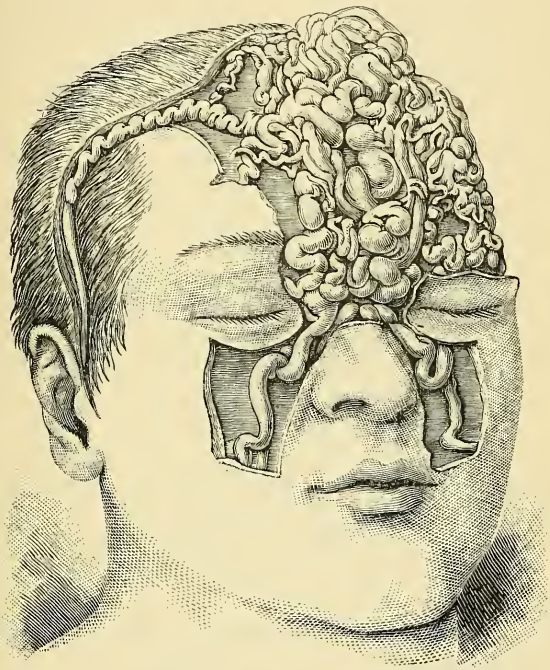

Fig. 82.- Dissection of a plexiform angeioma of the forehead. (*After H. Müller.*)

wine staining," when extensive, does not admit of treatment, but a stain of this character the size of a crown-piece may be successfully destroyed by electrolysis when it occurs in a conspicuous situation. The common species of nævus comes under observation almost daily; in such cases it is usual to watch the child in order to ascertain whether the nævus is growing or not; many nævi disappear, but when they become active and grow, they need prompt treatment. No method is so safe and effectual as excision, whenever it can be carried

out, remembering always **to cut the nævus out, not cut into it.** I have excised nævi, simple and cavernous, from the skin over an unclosed fontanelle, the eyelids, the tongue, labium, and other parts of the body in more than one hundred children, and never had the least untoward symptom. It is infinitely preferable to treatment by electrolysis, nitric acid, ethylate of sodium, and the ligature. The chief reason for excising nævi when they evince signs of activity is to prevent them from assuming such proportions as to pass beyond the limits of justifiable surgery. Many examples have been recorded in which a nævoid fleck in an infant has become a formidable tumour in the adult.

It is impossible to advise in regard to the treatment of plexiform angeiomata. Each case exhibits special features which will modify the operation, and the particular method employed will depend on the enterprise, experience, and skill of the surgeon in charge of the case. Several cases of plexiform angeioma of the limbs have been recorded in which it has been necessary to resort to amputation. When the leg is involved this operation is attended with unusual risk to life.

LYMPHANGEIOMATA.

A **lymphangeioma** has the same relation to lymphatics that an angeioma bears to hæmic capillaries.

There are three species of lymphangeiomata:—

(1) Lymphatic nævus; (2) cavernous lymphangeioma; (3) lymphatic cyst.

1. **Lymphatic Nævus.**—This species of lymphangeioma is, as a rule, colourless, but when containing a fair number of hæmic capillaries, then the nævus appears as a pale pink patch slightly raised above the level of the surrounding skin. When composed entirely of lymphatics it is white in colour; when pricked, lymph, sometimes mixed with blood, issues from it. Occasionally several nævi occur in the same individual; they vary greatly in size, some are as small as shot, others may have a diameter of 2 cm. or more. In many instances they are noticed a few months after birth, occasionally they seem to be acquired. This is probably explained on the ground that during infant life they are small, and

their want of colour saves them from detection until their increase in size later in life makes them conspicuous.

Lymphatic nævi may occur in the skin on any part of the trunk or limbs, and have been especially studied in the mucous membrane of the tongue and lips.

In connection with the tongue the affection may be localised to a definite area and give rise to a **lingual lymphangeioma**; this takes the form of a pale pink papilla, or clusters of smooth papillæ, projecting from the mucous membrane. Sometimes one-half of the dorsum of the tongue will be beset with small rounded projections. These projections consist of clusters of dilated lymphatic vessels.

There is a very rare disease of the tongue to which the name **macroglossia** is applied. Clinically the condition manifests itself as a congenital enlargement of the tongue implicating mainly its anterior two-thirds. As the child grows the tongue increases so disproportionately that the mouth accommodates it with difficulty, and at last the tip of the organ protrudes from the mouth and, in severe examples, becomes so big as to extend far beyond the margins of the lips. In the case represented in Fig. 83 the large tongue produced great deformity by everting the anterior portion of the mandible and increasing the distance between the teeth lodged in the everted portion.

The increase in the size of the tongue is not due to an overgrowth of its muscular substance, but is caused, as Virchow pointed out, by the formation of a lymphangeioma in connection with the lingual mucous membrane.

2. **Cavernous Lymphangeiomata.**—This species in its naked-eye characters resembles a lymphatic nævus, but on microscopical examination it will be found to be identical in structure with the cavernous nævus, with the difference that its cavities are filled with lymph instead of blood.

3. **Lymphatic Cyst.**—This species of lymphatic tumour is considered in the section devoted to congenital cysts of the neck.

The larger lymphatic channels, like veins, are apt to become varicose or form local dilatations, to which the term lymphatic varices are applicable. When the lymph stream from a part is interfered with, the cutaneous area drained by the obstructed

lymphatic becomes hard and brawny from lymphatic œdema; when a limb is thus affected it gradually passes into the enlarged brawny condition known as elephantiasis, of which there are many forms. It is, of course, beyond the scope of this work to study diseases of lymphatics in general, because

Fig. 83.—Macroglossia in a girl aged eleven years. (*After Humphry.**)

they run parallel with such morbid conditions of arteries and veins as aneurism, varix, thrombosis, embolism, and œdema.

Treatment.—The only species of lymphangeioma the treatment of which needs to be considered is macroglossia; this condition produces such an unpleasant appearance that it demands surgical assistance. The method usually adopted consists in the removal of the protruding portion of the tongue.

* Humphry, Med.-Chir. Trans. vol. xxxvi., p. 113; Barker, Trans. Path. Soc., vol. xli. 77.

CHAPTER XVIII.

GROUP II.—EPITHELIAL TUMOURS.

In the group of tumours now to be considered, epithelium is not only present, but is the essential and distinguishing feature. Epithelium is so disposed in the bodies of complex animals as to serve many functions: in some situations it acts as a protective—*e.g.*, the epidermis, where it becomes modified into hair, nail, horn, or into the hardest of all animal tissues—enamel: in others, processes of epithelial cells dip into the underlying connective tissue to form secreting glands; some of them are simple—*e.g.*, the tubular glands of the intestine: others are very complex—*e.g.*, the liver, mamma, and kidney. Whether a gland is simple or complex, the principle of construction is identical—namely, narrow channels lined with epithelium, resting upon a connective-tissue base, in which blood-vessels, lymphatics and nerves ramify.

Each epithelial recess of a gland is known as the acinus, and each acinus is in communication with a free surface, either directly by its own duct, as in the case of sebaceous and mucous glands, or indirectly by means of a number of main ducts, as in the case of the mamma: or by a common duct, as in the pancreas. To this rule there are three notable exceptions: the thyroid gland, the pituitary body, and the ovary. It is important to bear in mind the fact that, with the three exceptions mentioned, all secreting glands are in direct communication with free surfaces, and are therefore accessible to all kinds of micro-organisms.

The differences in the disposition of epithelium enable the oncologist to arrange epithelial tumours in four genera, the species in each genus being largely determined by peculiarities in the shape or disposition of the cells:—

Genera.	*Species.*
I. Papillomata	Skin warts.
	Villous papillomata.
	Intracystic warts.
	Psammomata.

Genera.	*Species.*
II. Epithelioma.	Epithelioma.
III. Adenoma	(*See* page 219.)
IV. Carcinoma (cancer).	(*See* page 220.)

PAPILLOMATA.

A **papilloma or wart** consists of an axis of fibrous tissue, containing blood-vessels, surmounted by epithelium, projecting from a epithelial-covered surface; it may be simple, and present a uniform surface, or be so covered with secondary processes as to look like a mulberry. When the processes are long the papilloma has a villous appearance.

There are four species of papillomata:—1, Warts; 2, villous papillomata; 3, intracystic warts; 4, psammomata.

1. **Warts.**—Papillomata of this species are most common on the skin, but warts also arise from mucous surfaces covered with squamous epithelium. They occur singly or in multiples and are rarely painful unless irritated, then they are apt to ulcerate and bleed. Crops of warts are often seen on the hands of children. They are common in the region of the anus, vagina, and glans penis when these parts are irritated by foul discharges, especially those of gonorrhœal origin. A curious feature of multiple warts is that they sometimes appear on the hands or scalp almost suddenly, and after persisting many weeks, or perhaps months, disappear as if by magic. When warts are thickly crowded upon a limited area of skin—such, for example, as the glans penis—they are apt to be mistaken for more serious disease, such as warty epithelioma.

Skin warts are overgrown papillæ, and, in sections, the epithelium will be found to pass from one papilla to another in an unbroken line without invading the fibrous framework.

A solitary wart may occur on any skin-covered surface and persist. A wart of this character sometimes attains the size of a walnut, and in some cases is mottled with black pigment. Such warts, late in life, may become the starting-points of melanomata.

A wart occasionally grows rapidly, and may even attain the size of the closed fist, and look very formidable. An admirable example has been recorded by McCarthy. A man seventy-six years of age came under his care with a tumour of the

size of half an orange completely concealing the right eye. This tumour was very vascular, bled freely on the slightest manipulation, and though appearing to spring from the orbit, really grew from the right cheek immediately below the eyelid.

Fig. 84.—Wart growing from the skin of the cheek and obscuring the eye. (*After McCarthy.*)

The patient had had a small wart on the cheek; this grew to the size of a walnut, and was then removed with a cautery. It quickly returned, and attained the size represented in Fig. 84 in about thirteen months. It was removed and examined microscopically by McCarthy. The cut surface of the tumour was dotted with numerous yellow circular dots of the size of a pin's head. Magnified sections showed the tumour to consist of large branching columns of epithelial cells; the cells were large, with oval nuclei, and the centre of some of the columns was occupied with necrotic tissue. The plan of structure of

this tumour is shown in Fig. 85, and McCarthy points out that it is identical with the variety of tumour originating in soft warts of the face to which Billroth* applies the term plexiform sarcoma. McCarthy points out that this is inconsistent with the structure of sarcomata, for these plexiform cord-like bands are composed of epithelial cells.

I have had an opportunity of studying a tumour in every way similar to the case just mentioned, only the growth was seated among the pubic hairs of a man thirty-six years of age.

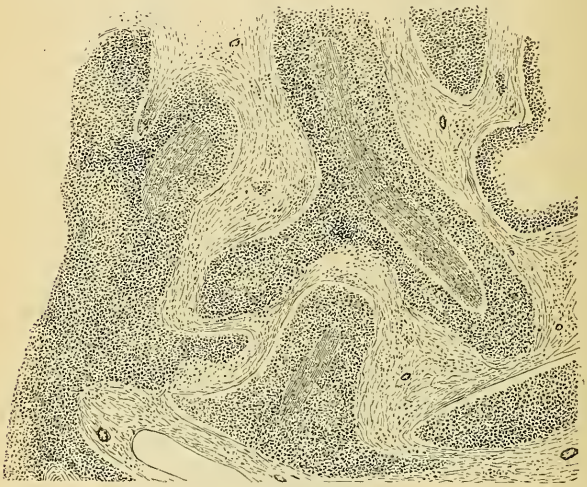

Fig. 85.—Microscopical characters of the wart in the preceding figure.

(Plate IV.) The tumour originated in a wart, was as large as a closed fist, as pink as a cock's comb, smeared with purulent fluid, and exhaled an abominable odour. The glands in each groin were enlarged. The tumour was freely removed, and as the wound cicatrised the inguinal glands dwindled to their natural size. This was sufficient evidence that the growth was not malignant.

Histologically the tumour was identical with that so well described by McCarthy,† and I have no difficulty in accepting his reiterated opinion that the plexiform cord-like bands are composed of epithelial cells, and the growths are very large warts.

* "Surgical Pathology," ed. 8, p. 414, vol. ii

† Trans. Path. Soc., vols. xxxi., p. 256; xxxiii. (Sup. Rep.), and xliii., p. 161.

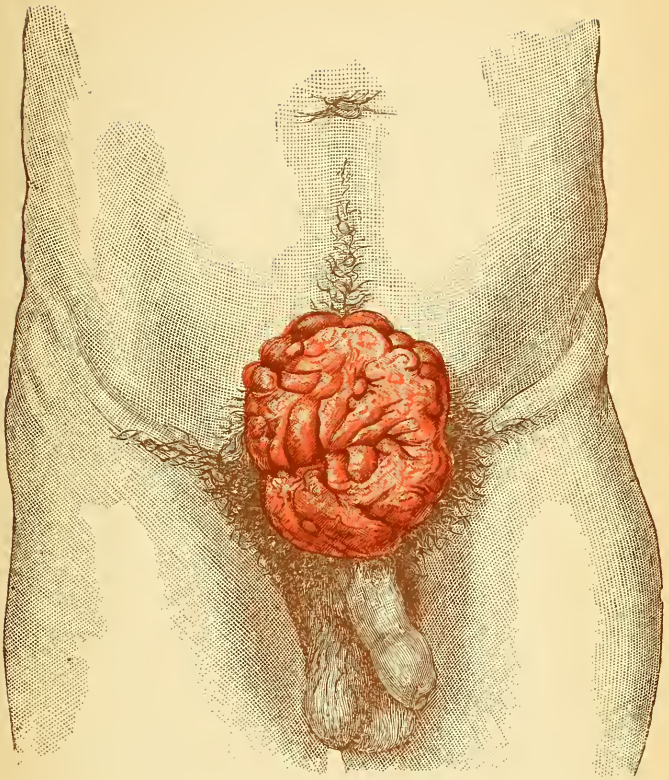

PLATE IV.—An unusual form of Wart, growing from the Skin of the Pubes. (*Trans. Path. Soc.*, vol. xliii., 161.)

In sections prepared from my specimen the epithelial cylinders were so large as to be visible to the naked eye. A second case was brought under my notice by Dr. Saville in a woman nearly forty years of age: in this instance the wart grew from the skin of the left temple. In this specimen it could easily be shown that the epithelial processes were exaggerated papillæ of the skin.

The difficulty of demonstrating the continuity of the epithelial columns with the papillæ of the adjacent skin, is due to the circumstance that the surfaces of the warts, in the cases depicted in Fig. 84 and Plate IV. were destroyed by ulceration.

Cutaneous warts are by no means uncommon in domesticated animals. They are frequent on the penes of horses and bulls, the lips of lambs, and the pads on the feet of dogs and other species of carnivora.

Warts similar in structure to those of the skin occur on mucous membranes with a covering of squamous epithelium, such as the lips, buccal aspect of the cheeks, vestibule of the nose, and the larynx. The œsophagus of the ox is occasionally the seat of a multitude of dendritic warts.

Warts on mucous membranes are not so common as on cutaneous surfaces, but they are apt to give rise to much more serious consequences, especially when springing from the interior of the larynx.

Laryngeal Warts.—In the larynx warts most commonly spring from the mucous membrane covering the true cords; frequently they grow immediately beneath the cords, and a not uncommon situation is immediately beneath the point of attachment of the vocal cords to the thyroid cartilage. Exceptionally a large mulberry-like wart has been detected growing from the floor of the sinus pyriformis. In number laryngeal warts vary greatly. Often one is present; in other cases ten or more will be found. In size there are great differences; some will be no larger than the head of a pin; they rarely exceed the dimensions of a small cherry, and as a rule, they are no bigger than split peas. The warts may be sessile or pedunculated; in the latter case they sometimes possess great mobility, and occasionally get nipped between the vocal cords and give rise to urgent dyspnœa,

which sometimes ends in suffocation. In colour they are of a delicate pink, sometimes of a whitish tint resembling the colour of the healthy cords. Hæmorrhage into their substance causes them to assume a deep red tint.

Laryngeal warts occur in children and in adults. A curious feature connected with them in children is their disappearance after tracheotomy. This is somewhat similar to the sudden way in which cutaneous warts occasionally vanish.

Warts are covered with squamous epithelium, and the cells are liable to become transformed into horny material

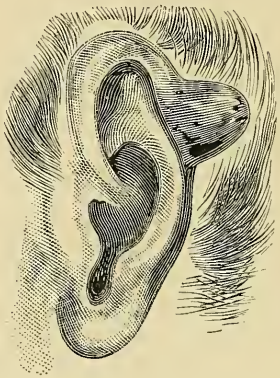

Fig. 86.—Wart-horn growing on the pinna

and form a cutaneous horn (Fig. 86). Some of these horns have attained almost fabulous sizes.

As cutaneous horns arise from other abnormal conditions, it is usual to describe those arising from warts as wart-horns, and it will be convenient to defer their consideration to a separate chapter dealing with horns in general.

2. **Villous Papillomata.**—These grow from the mucous membrane of the bladder, and occasionally in the renal pelvis; the condition is usually termed "villous disease." The general appearance of the long, branching, feathery tufts recalls in a striking manner the delicate chorionic villi. Structurally, the villi which surmount bladder-warts are identical with the chorionic villi in that they consist of a connective-tissue core traversed by delicate blood-vessels, the whole being surmounted by epithelium.

These villous growths sometimes have broad bases, but in other cases the points of attachment are so narrow that the tumours may be described as pedunculated. Usually villous tumours of the bladder occur singly, but two, three, or more may be found in the same bladder. Occasionally there is one fairly large growth and several smaller masses of the size of peas. In some instances they occur at or near the orifice of

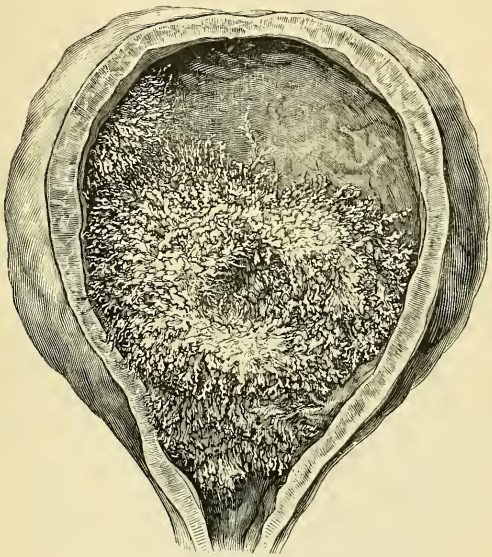

Fig. 87.—Villous tumour of the bladder.

the ureter, and though small, the tumour will give rise to serious changes in the corresponding kidney by obstructing the flow of urine from the ureter. When the growth is situated near the neck of the bladder the long villous tufts will sometimes be carried by an outflowing current of urine into the urethral orifice and cause impediment to its free escape. (Fig. 87.) The delicate character of the villi and their vascularity are sources of danger because the processes themselves are sometimes torn, and the hæmorrhage is occasionally so severe as to place the life of the individual in peril.

Villous growths, in every way identical with those found in the bladder, are sometimes found growing from the pelvis

of the kidney. In one very striking case of this sort recorded by Dr. Murchison* the pelves of the kidneys of a man sixty-five years of age were found thus occupied (Fig. 88), and a singular feature of the case was the presence of two villous tumours in the bladder, one at the orifice of each ureter. It is not improbable, from what we know of the habits of warts

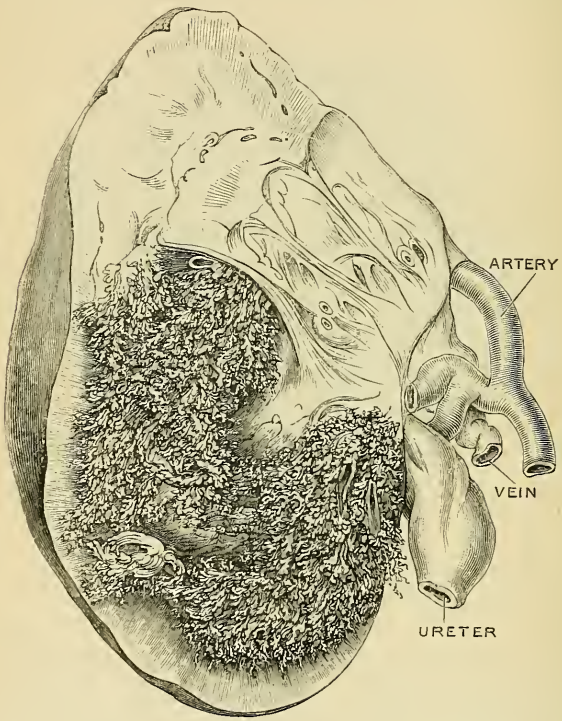

Fig. 88.—Pelvis of a kidney with a villous papilloma. (*Museum, Middlesex Hospital.*)

generally, that in this exceptional instance the vesical warts were due to transplantations of epithelium from the pelvis of the kidney to the mucous membrane of the bladder.

It must be remembered that the surface of a vesical tumour is often very ragged, but care must be taken not to confound a villous papilloma of the bladder with an ulcerating malignant vesical tumour. There is reason to believe that this happens in practice.

* Trans. Path. Soc., vol. xxi. 241.

Villous tumours of the renal pelvis appear to be very rare judging from the paucity of recorded cases.

There is an interesting variety of villous papilloma which arises from the **choroid plexuses** of the cerebral ventricles. These plexuses are fringed with tufts of epithelial-covered villi which occasionally grow luxuriantly and attain a size sufficient to give rise to unpleasant effects, particularly when the choroid plexus of the fourth ventricle behaves in this manner. J. H. Douty* described a case of "villous tumour of the fourth ventricle" in which the tumour was as large as a bantam's egg; it obstructed the interventricular communications and led to distension of the lateral and third ventricles; the aqueduct of Sylvius was dilated to the size of a quill. The patient was a boy seventeen years old, and the clinical features were such as to permit of accurate localisation of the lesion during life.

Dr. Clifford Allbutt† has recorded the facts relating to a girl nine years of age who had a villous tumour sprouting into the subarachnoid space from the left side of the medulla. The description of the case is sufficient to show that it arose from the choroid plexus of the left cornucopia. The situation of the tumour was accurately localised during life.

Villous tumours of the ventricles rarely attain such a size without undergoing calcification and becoming transformed into psammomata, a species of tumour that will be more conveniently dealt with in a separate chapter.

3. **Intracystic villous papillomata** sometimes arise in mammary cysts. The specimen depicted in Fig. 89 is a good example. The cyst itself is formed by the dilatation of a galactophorous duct and is lined with cubical epithelium; from one side of the cyst a villous papilloma has grown, and the processes completely fill and distend its cavity. The processes have exactly the same structure as the villi in vesical papillomata. In this form of intracystic papilloma the analogy to the vesical tumour is further borne out by their liability to hæmorrhage, an abundant discharge of blood-stained fluid from the nipple being a fairly constant clinical feature.

* *Brain*, vol. viii. 409.

† Trans. Path. Soc., vol. xix. 20.

Pollard* has described and figured a good case of villous papilloma in a cyst which probably arose in an accessory thyroid gland.

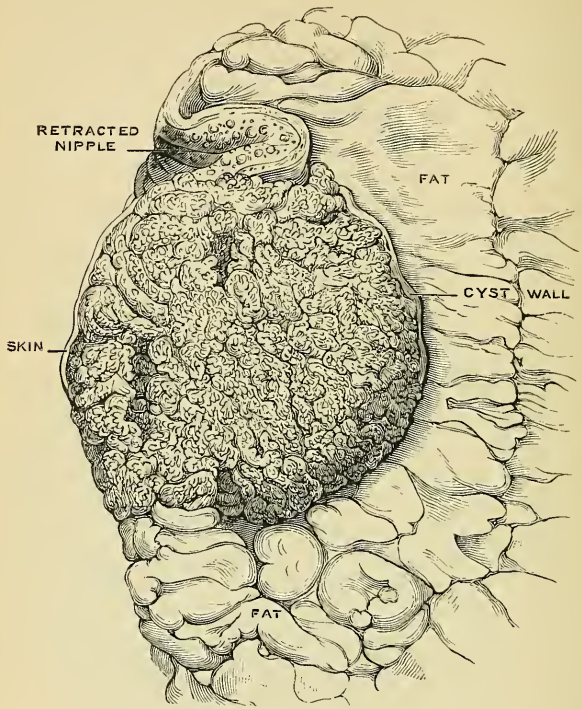

Fig. 89.—Section of a mamma with a dilated duct filled with villous papillomata. (From a woman sixty-eight years of age.†)

The description of cysts with luxuriant papillomata which sometimes arise in the **paroöphoron** should be read in connection with this chapter.

* Trans. Path. Soc., vol. xxxvii. 507.
† Trans. Path. Soc., vol. xliii. 117.

CHAPTER XIX.

PAPILLOMATA (*concluded*).

4. **Psammomata.**—These are tumours composed of globular bodies consisting of epithelial cells arranged in layers, usually calcified, and embedded in connective tissue; they are confined exclusively to the pia mater of the brain and spinal cord. In the case of the brain the epithelium is derived from the villous processes of the choroid plexuses of the ventricles; hence psammomata are most frequently found in connection with the velum interpositum, the roof of the fourth

Fig. 90.—Microscopical appearance of a typical psammoma.

ventricle, and those prolongations of its choroid plexus which occupy the lateral recesses and come into relation with each cornucopia.

The amount of calcareous material in a psammoma is sometimes so abundant that it feels like stone. This earthy matter, not only in composition, but also in its relation to the tissue of the tumour, is identical with that in the pineal body.

The concentric bodies are intimately associated with the blood-vessels of the tumour. A psammoma rarely exceeds in size a shelled walnut, whilst specimens no bigger than peas are

very common on the choroid plexuses of the lateral ventricles, and in this situation they are often bilateral; in the third ventricle a psammoma is nearly always single, and this is the case with the fourth ventricle, except when springing from those portions of the plexus which lie in the lateral recesses; they are then apt to be bilateral.

When psammomata occupy the lateral ventricles they will often attain a fair size without giving rise to symptoms,

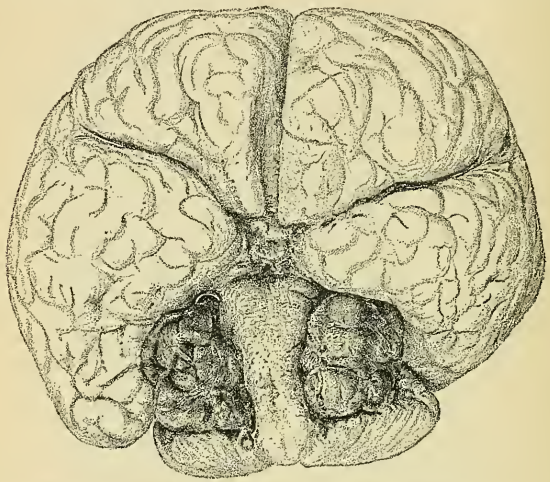

Fig. 91.—Bilateral psammomata in relation with the lateral recesses of the fourth ventricle. (*After Strahan.*)

although they produce in some instances deep bays in the substance of the optic thalami.* The situation of the tumour materially influences its effects upon the cerebral functions. Beevor† has described a case in which a psammoma 7·5 cm. by 6 cm. grew from the membranes over the median lobe of the cerebellum in a lad, and caused headache, vomiting, blindness, optic neuritis, priapism, opisthotonos, and other disturbances, ending in death.

The most interesting examples arise from the villi of the choroid plexus in relation with the cornucopia, and are often bilateral. A typical specimen is represented in Fig. 91 from a man twenty-eight years of age: he was violent, suicidal, blind,

* Eve, Trans. Path. Soc., vol. xxxiii. 14.

† *Brain*, July, 1881.

and deaf. In this situation the tumours came into relation with the seventh, eighth, ninth, and tenth cranial nerves as they issued from the bulb, and with the flocculus. The clinical history of the case is given very carefully by Strahan.*

It is easy to understand that tumours growing in such close relation with important nerves as the trigeminal, facial, vagus, etc., would soon lead to symptoms and surely attract attention, and as a matter of fact, a large number of examples have been recorded under a variety of names, such as sarcomatous tumours of the fifth and seventh nerves; fibro-sarcomatous tumours of the flocculus; symmetrical tumours of the medulla, and the like. Although fibrous tumours (neuromata) undoubtedly grow from the intracranial portions of the fifth, seventh, and other nerves arising from the medulla oblongata, yet the majority of tumours found in the immediate vicinity of the flocculus are psammomata connected with the villi of the choroid plexuses of the fourth ventricle.

In the memorable exhibition of cerebral tumours that took place at the Pathological Society, London, in 1886, some good specimens of psammomata in the floccular region were exhibited by Drs. Goodhart, F. Taylor, and Beevor. In most of the cases there was headache, vomiting, and deafness; in several difficulty of swallowing and, when the tumour was large, unsteady gait, probably due to pressure upon the cerebral peduncles.

It is somewhat curious that of some score or more of these cases which are recorded, and which were observed very carefully, none of the observers recognised the fact that the tumours were identical with psammomata of the lateral ventricles.

Psammomata are fairly common growing from the choroid plexuses of the lateral ventricles of horses. In this situation they may attain the size of a walnut and not obviously disturb the function of the organ. When they attain a larger size one tumour usually outstrips the other, as in Fig. 92; and I have seen two of these tumours in the lateral ventricles, one being as large as a hen's egg and the other equal to that of a bantam. Such large growths produce grave and even furious symptoms. The pressure effects alone will kill the horse; but

* *Journal of Mental Science*, vol. xxix. 246.

in some of the reported cases the animals have destroyed themselves by wild plunges made during attacks of delirium.

Psammomata in horses are very vascular; some of the tumours are soft and contain little grit, whilst others are quite hard. Similar variations in the consistence of these tumours

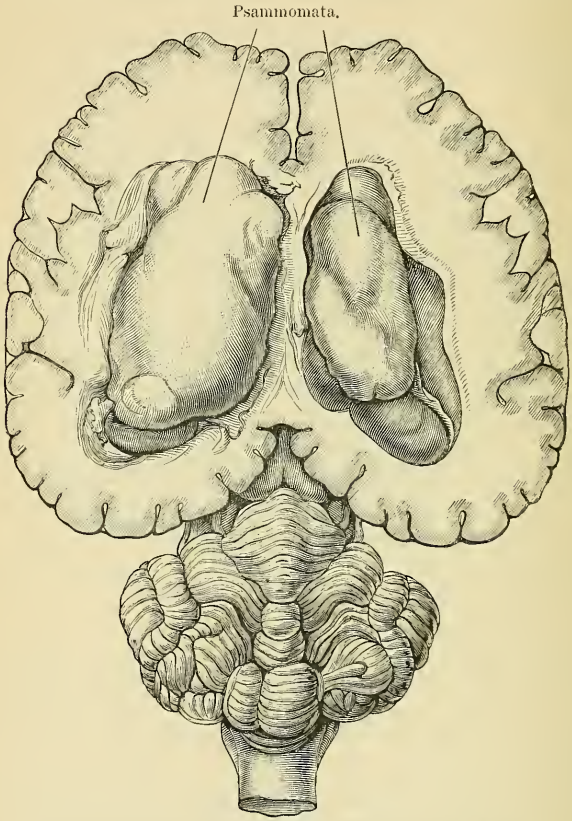

Fig. 92.—Psammomata in the lateral ventricle of a horse's brain.

occur in the human subject, but the psammoma of the horse differs from that of man in the fact that large quantities of cholesterine are present. Thus in a tumour found in the right lateral ventricle of an old horse, Lassaigne reported that it was composed of 58 parts of cholesterine, 39·5 membrane and albuminous matter, 2·5 sub-phosphate of lime. Every writer on these bodies in the cerebral ventricles of the horse refers to the

large amount of cholesterine they contain.* In man, the sabulous material of psammomata consists of phosphate and carbonate of lime, with a little phosphate of magnesia and ammonia.

A careful study of these tumours would lead us to use the term psammoma for tumours having the structure of the choroid plexuses, whether they were soft or calcified. As a typical example of a soft or uncalcified psammoma reference

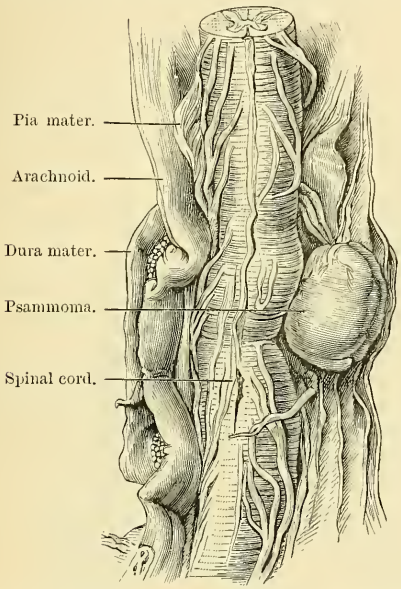

Fig. 93.—Portion of the spinal cord with a psammoma. (*Museum, Middlesex Hospital.*)

may be made to Ashby's case,† in which a boy three and a half years of age died with all the symptoms of cerebral tumour. The left lateral ventricle was occupied by a soft lobulated vascular mass which had apparently commenced in the choroid plexus, and consisted of capillary vessels distended with blood, with epithelial cells arranged around them.

Psammomata of the Spinal Membranes lead to far more serious results than tumours of a similar size in the lateral ventricles, and are almost as dangerous when seated high in

* Gamgee, *Veterinarian*, 1852.

† Trans. Path. Soc., vol. xxxvii., p. 56.

the spinal canal as psammomata near the flocculus. In the spinal canal these tumours do not attain a large size—indeed in the few recorded cases there is singular uniformity in their shape and dimensions.

A typical example of a psammoma of the spinal membranes is sketched in Fig. 93. The specimen now preserved in the museum of the Middlesex Hospital was described in 1865 by Dr. Cayley.* The tumour was situated on the left side of the cord, at a spot corresponding to the interval between the tenth and eleventh thoracic vertebræ. It was of oval shape, and measured 3 cm. in its long, and 1·5 cm. in its short axis; its surface was smooth, and appeared to be invested by the arachnoid. The cord was much compressed and softened by the tumour. The patient, a woman forty-six years of age, died paraplegic. The history of all such cases has been slow progressive paralysis and death. In the future, such cases will be submitted to surgical measures.

* Trans. Path. Soc., vol. xvi., p. 21; for similar cases *see* Whipham, *ibid.*, vol. xxiv. 15; Hutchinson, *ibid.*, xxxiii. 23; and Lediard, *ibid.*, xxxiii. 25.

Note.—Müller described under the name cholesteatoma certain tumours composed of layers of epithelium mixed with cholesterine, or calcareous matter: it probably included a certain variety of sebaceous cyst, psammomata, epithelial pearls, and the "nests" of epithelioma. In recent years the term has been used even more vaguely, so that it becomes urgently necessary to drop it.

CHAPTER XX.

CUTANEOUS HORNS.

Cutaneous Horns in the human subject are of four varieties :—

1. Sebaceous horns.
2. Wart horns.
3. Cicatricial horns.
4. Nail horns.

1. **Sebaceous Horns** are very common, and arise in situations where sebaceous glands exist. They are formed in

Fig. 94.—Cutaneous horn : the widow Dimanche.

consequence of the protrusion of the contents of a sebaceous cyst through a rupture in the cyst wall, or through the duct of the follicle, which becomes desiccated on exposure to the air : fresh material is added to the base of the horn, until at last a horn may be produced measuring in some instances 15 cm.

One of the most remarkable cases is that of the widow Dimanche. She was a "dame aux halles." A long horn

grew from the forehead, as represented in Fig. 94, and a smaller one from the right cheek. A wax cast of this woman's face is preserved in the museum of the Royal College of Surgeons, England.

Sebaceous horns are extremely tough, and present a longitudinal fibrillation; when soaked in a weak solution of liquor

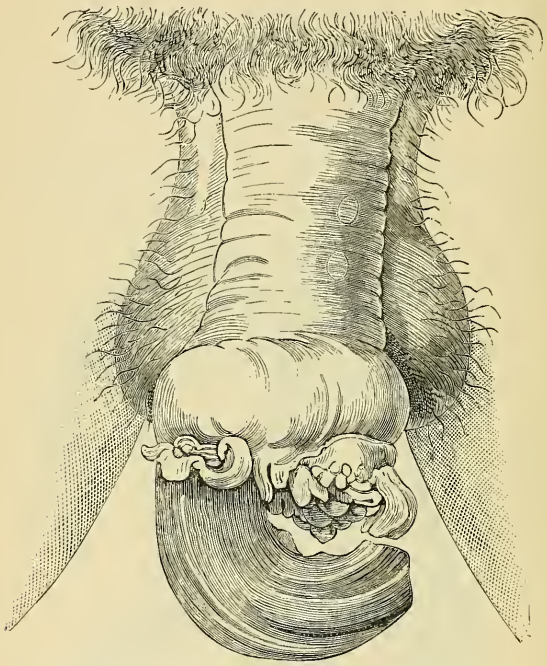

Fig. 95.—Cutaneous horn from the penis. (*After Pick.**)

potassæ they quickly soften and the horny material comes away in flakes.

2. A **Wart Horn** is structurally identical with the sebaceous horn, and it is impossible to decide from an examination of a large horn whether it grew from a sebaceous cyst or from a wart. Sebaceous horns are more frequent on the scalp than elsewhere, whilst wart horns are most frequently found on the penis (Fig. 95), and are not rare on the pinna. It is important to bear in mind that epithelioma is apt to

* Arch. für Dermat. und Syph., 1875, s. 315.

originate in the skin around the bases of wart horns, especially in elderly patients.

The only means of deciding between a wart horn and a sebaceous horn is by dividing them longitudinally, and ascertaining the existence or otherwise of a cyst at the base of the horns. In the case of the mouse sketched in Fig. 96, some pathologists who examined it were of opinion that it was a wart horn, but on dissection a large sebaceous cyst was

Fig. 96.—Sebaceous horn in a mouse.

found to occupy its base. Horns of this character are not rare in mice.

The most elaborate collection of cases illustrating cutaneous horns is contained in a small work published by Dr. Herman Lebert.* He gives accounts of one hundred and nine cases with references, the earliest dating from the year 1300. The horns were found on the scalp, temple, forehead, eyelid, nose, lip, cheek, shoulder, arm, elbow, thigh, leg, knee, toe, axilla, thorax, buttock, loin, penis, and scrotum. In length they varied from 1 to 20 cm. Lebert, however, makes no attempt to discriminate between the variety of horns.

The most curious situation in which cutaneous horns occur is in ovarian dermoids growing from sebaceous cysts in the skin lining the cavities of these tumours. The conversion of epithelium into horn in cases of sebaceous cysts and warts

* "Ueber Keratose," Breslau, 1864.

is something more than desiccation from exposure; it is doubtless akin to the change by which nail and horn are formed under normal conditions.

A good physiological type of a wart horn is presented by the nasal horn of the rhinoceros, for this formidable cutaneous appendage is nothing more than a gigantic wart. Professor Flower exhibited at the Zoological Society,* London, a portion of the skin from the head of a rhinoceros (shot by Sir John

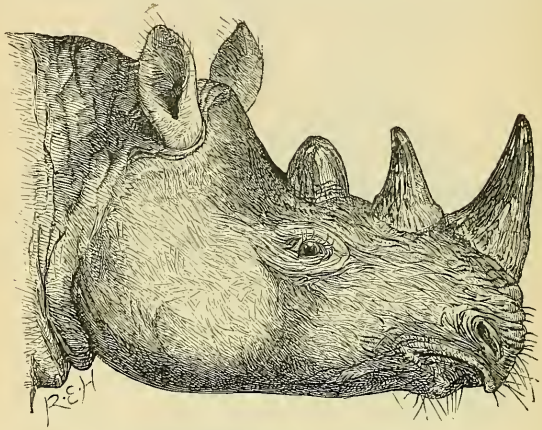

Fig. 97.—Head of an African rhinoceros with a large wart posterior to and in a line with its nasal horns.

C. Willoughby† in Central Africa) furnished with three horns. The accessory horn is structurally a wart; it was 12 cm. high, and 42 cm. in circumference. (Fig. 97.)

A physiological type of sebaceous horns is furnished by the curious patch of spines on the forearm of Hapalemur (*Hapalemur griseus*). It is present only in the adult male. The spines are identical in structure with sebaceous horns, and are formed of hardened secretion furnished by a multitude of glands in the skin immediately underlying the patch of spines. The male Ring-tailed Lemur (*Lemur catta*) has a curious horn-like spur upon its forearm near the wrist, also associated with a collection of glands.‡

Cutaneous horns are sometimes found on cows, sheep, and goats. They may attain a large size. The museum of the

* Proc. Zool. Soc., 1889, p. 448. † "East Africa and its Big Game," 1889, p. 155.
‡ Proc. Zool. Soc., 1887, p. 369.

Royal College of Surgeons contains a very large horn that grew from the flank of a ram. This horn is nearly a metre in length, and in its dried condition is 28 cm. in circumference at the base. This specimen is described with others

Fig. 98.—Head and leg of a thrush with cutaneous horns. The horns were cast each time the bird moulted.

by Sir Everard Home in an interesting paper in the Phil. Trans., 1791.

Birds are liable to cutaneous horns; they grow very rapidly, and sometimes attain great lengths. It is also a curious fact that they follow the rule with regard to the epidermic structures in this class generally, and are cast off when the birds moult.

In the case of the thrush whose head and leg are sketched in Fig. 98, the horn on the head probably grew from a sebaceous cyst, and that on the leg from a wart. I have seen similar horns in canaries, linnets, blackbirds, and in an oyster-catcher.

3. Horns growing in the **cicatrices of burns** are very rare.

The best example which has come under my notice I owe to Mr. P. Bentlif of Jersey. The patient, a woman forty-nine years of age, was severely burnt when a child over the lower part of the trunk and thigh. At the age of forty-two years a portion of the scar on the thigh ulcerated and slowly healed; as it healed it became scaly, and in the course of the succeeding six years the superimposed scales formed the large flat-topped horn represented in Fig. 99. This horn is 5 cm. square at the base and nearly 3 cm. high, and the material of which it is formed is regularly stratified like a pie-crust.

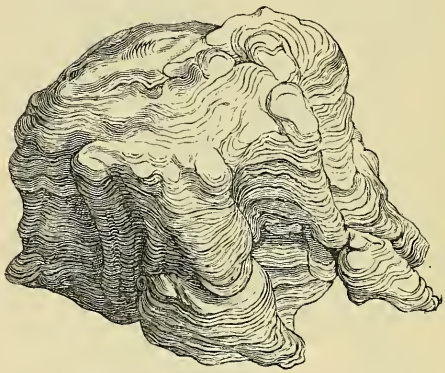

Fig. 99.—Horn formed on the cicatrix of a burn. (*Museum, Middlesex Hospital.*)

After the horn had been growing steadily for six years it loosened and fell off in the night, leaving an ulcerated surface. As the ulcer healed a new horn began to form.

The most remarkable horn originating in this way is described by Cruveilhier.* The specimen formed part of Béclard's collection, and is sketched in Fig. 100. On the palmar aspect of the hand there is a horny mass, with numerous projections, varying in length from 2 to 20 cm.; the corneous material is disposed in some parts in laminæ, but in others has a longitudinal disposition. In the absence of a history, Cruveilhier could only conjecture as to the cause of this astonishing production, but he describes some similarly-shaped horns that came under his notice in the thighs of old women at the Salpêtrière; the horns grew from the scars of old burns When they became detached they left painful ulcers.

* Anat. Path., pl. vi., Livraison, vii.

Mr. Edmunds* exhibited to the Pathological Society, London, a horn, very similar to Cruveilhier's specimen, which originated in the scar of a burn on the hand sustained sixty-

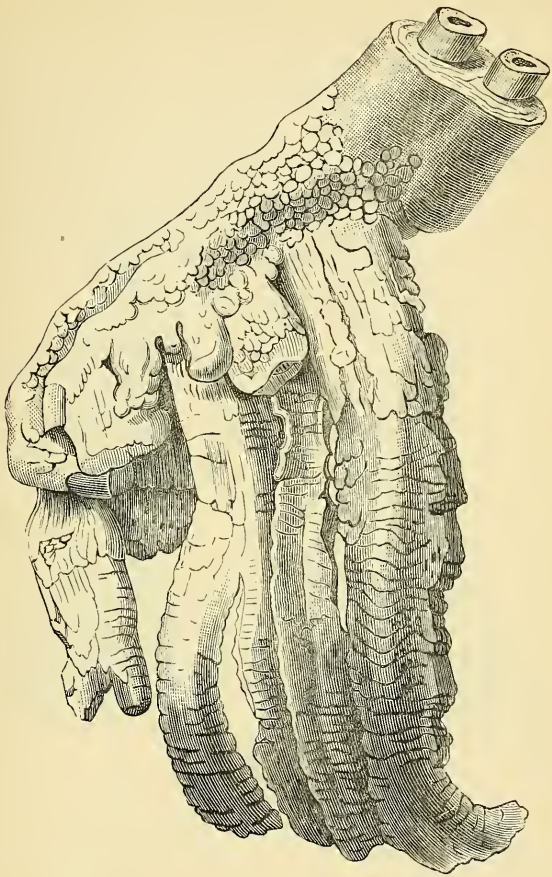

Fig. 100.—Horns growing from the scar of a burn. (*After Cruveilhier.*)

five years previously. After the horn had been growing three years it began to slough, and in the course of the next two years became so offensive as to necessitate amputation.

4. **Nail Horns** do not call for much consideration. They are extremely common on the toes of bedridden patients, especially old women and those who are dirty. Although nail horns may

* Trans. Path. Soc., vol. xxxviii., p. 352.

grow on any of the toes, they are most frequently met with on the big toe. The horns may attain a length of 7 cm., and become twisted so as to resemble ram's horns.

Treatment.—Cutaneous horns are easily detached by a sudden jerk with the thumb and forefinger: if they are too firmly fixed to be removed in this way, then they may be excised. An exceptional case, such as that depicted in Fig. 100, will demand amputation, and in a few instances surgeons have thought it necessary to remove the extremity of the penis when the skin surrounding the base of the horn has been ulcerated. When epithelioma attacks the skin at the base of a horn, it should, with the surrounding skin, be early excised.

CHAPTER XXI.

EPITHELIOMA.

An epithelioma may arise on any part of the body where stratified epithelium exists, but is more prone to occur in situations where there is a transition from one kind of epithelium to

Fig. 101.—Epithelioma of the upper lip (early stage).

another, and especially at spots where skin and mucous membrane come into relation—*e.g.* the lips and the anus.

Histologically, an epithelioma differs from a wart in the fact that the epithelium is no longer limited by the basement membrane, but passes beyond it into the underlying connective tissue. This invasion is attended by peculiar cell formations, known as epithelial nests. The disease almost invariably recurs after removal, and is exceptionally liable to infect the neighbouring lymph glands.

An epithelioma may make its appearance as a wart, as a fissure, or as a nodule on the surface of skin or mucous membrane. Perhaps the most frequent form is that depicted in Fig. 101, where the epithelioma has the look of an ulcer with raised, rampart-like edges; the ulceration is due to necrosis of the cells forming the central parts of the initial nodule.

Fig. 102.—Epithelioma of the lip, beginning in a fissure.

When the disease starts in a fissure, and ulceration keeps pace with the infiltration, then, instead of raised edges, the ulcer has margins as sharply defined as those of a rodent ulcer: occasionally the edges are undermined. (Fig. 102.)

There is a third variety, in which processes project from the skin like warts, and their free surfaces are sometimes quite horny. (Fig. 103.)

Although these three clinical varieties of epithelioma look so different, they are identical in structure. When sections are cut in such a way as to include not only the edge of the ulcer but the adjoining tissue also, the surface epithelium will

be found to dip into the underlying tissue in the form of long columns. (Fig. 104.) The parts around these cell-columns are infiltrated with adventitious cells; among and beyond these columns, as well as within them, curious concentric cellular

Fig. 103.—"Warty" variety of epithelioma.

bodies, known as epithelial nests, are met with. The cells composing these nests are arranged around two or more altered cells like the layers of an onion. The cell-columns are not enclosed by a membrane, and some of the larger columns tend to branch and even fuse with adjacent columns, forming a network in the deeper tissues. It matters not whether the epithelioma grows on the lip, the tongue, the larynx, or the edge of a scar on the leg or hand, this peculiar disposition of cell-columns is observed accompanied by the cell-nests The

size of the columns and the number of the nests vary in different cases, but the plan of invasion is the same in all cases.

It is important to bear in mind that the three clinical varieties of epithelioma occur in most of the situations that are liable to this disease; in addition to the lip, it has come under my notice in the tongue, anus, buccal aspect of the cheek, glans

Fig. 104.—Microscopic appearance of the cells in epithelioma; the connective tissue stroma is omitted. (*After Sheridan Delépine.*)

penis, vaginal surface of the uterine cervix, and at the edge of old scars. The non-recognition of these three manifestations of epithelioma has produced much confusion in surgical writings. For instance, the warty form has in many instances been described as epithelioma supervening on warts.

The primary ulcers when left to themselves may extend and involve extensive tracts of tissue, or fungate and form huge granulating cauliflower-like growths. In either case the superficial parts are continually being cast off in a foul, fœtid discharge containing sloughs of tissue, cellular detritus, and

blood. Any vascular tissue, such as skin, muscle, and mucous membrane, is quickly infiltrated and destroyed; even bone is rapidly eroded and removed piecemeal. Cartilage resists invasion, and this is seen in a striking way in those rare instances when epithelioma attacks the pinna; the skin and soft tissues quickly disappear, whilst its cartilaginous framework stands prominently out among the surrounding ruin.

Epithelioma in whatever situation it occurs usually destroys life rapidly. The quickness with which it ulcerates and overcomes all resistance enables it to open up large blood-vessels should any lie in its way. Hence death from hæmorrhage is frequent; when the tumour is near the air-passages, foul material is inspired and initiates septic pneumonia.

Particular modes of death occur according to the situation of the epithelioma, and it will be more convenient to refer to these when dealing with the disease in the various situations in which it occurs than to attempt a summary of them here.

The three varieties exhibit different degrees of malignancy. The burrowing variety rapidly kills, whilst the warty epithelioma runs much the slowest course; but each manifests its malignancy in the same manner by recurring after removal, by infecting adjacent lymph glands, and occasionally by dissemination.

Lymph Gland Infection.—The rapidity with which lymph glands are affected constitutes at the same time the most remarkable and dangerous feature of epithelioma; the large size the infected glands attain in many cases is often astonishing, and their enlargement stands in no relation to the size of the initial lesion, for an epithelioma 2 cm. square, or less, will lead to the formation of a gland tumour as big as a cocoa-nut. Such conditions are most frequently met with when the tongue, lip, and scrotum are the seats of epithelioma.

The gland complication in epithelioma is always a serious element of danger. When the cervical glands are enlarged they interfere with the trachea and œsophagus. They also become firmly adherent to the sheaths of big vessels, and as the glands break down the ulceration not infrequently opens up the jugular vein or carotid artery, and, in the inguinal region, the femoral vessels. A peculiarity of glands infiltrated by

epithelioma is the tendency they exhibit to break down in the centre and form spurious cysts. This should be remembered, for fluctuating glands associated with epithelioma does not necessarily signify suppuration. When the skin becomes implicated large portions of the infected glands slough, and leave large, horrible gaps, from which a foul fœtid discharge proceeds, whilst the edges of the chasm produced by the sloughing continue to extend and involve the neighbouring tissues.

Dissemination. — It has already been mentioned that secondary deposits are exceptional in epithelioma; it cannot be said that they are rare, but dissemination certainly happens far less frequently, and never so extensively as in cancer. It is also noteworthy that epithelioma is in some situations more liable to disseminate than in others. For example, secondary deposits are rarely met with when this disease attacks the larynx, and the mucous membrane in relation with the mandible or maxillæ, and the œsophagus. The explanation sometimes offered of this peculiarity is that epithelioma in these situations usually runs a rapid course, and often destroys life so quickly that the period is too short to allow of the formation of secondary nodules. This is inadmissible, as in epithelioma of the scrotum dissemination is almost as exceptional as when the larynx is attacked.

Treatment.—The principles on which surgeons rely for the treatment of epithelioma are :—

(1) Early and free removal of the diseased part whenever it is in an accessible situation.
(2) When adjacent lymph glands are enlarged they should be dissected out coincidently with the removal of the primary lesion.
(3) When there is recurrence, and the condition of the part admits, and the general health of the patient is such as will permit an operation to be performed with safety, the tumour should be excised.

The early excision of epithelioma is practised for two very important reasons :—

The earlier the diseased area is removed the greater the prospect of eradicating the disease before it infects the adjacent lymph glands.

The extirpation of an epithelioma in its early stages is oftentimes a very trivial proceeding; when allowed to extend, its complete removal will often demand a very extensive, difficult, and frequently a dangerous operation, and often is an impossible task.

It is difficult to formulate rules for the operative treatment of epithelioma and to decide what is, and what is not justifiable surgery. Every surgeon must be guided by individual experience. It is exceedingly difficult to express collectively the effects of operation in eradicating this disease. The facts broadly stated stand thus :—

In a small proportion of cases the operation is of doubtful utility, and in a few instances life is sacrificed in consequence of the interference.

On the other hand, a large number of patients derive the greatest comfort, and their lives are certainly prolonged in consequence of operation.

In a small number of instances an actual cure is brought about. When an epithelioma is removed and there is no recurrence for five years, the individual may be regarded as cured. The results and relative dangers of operations for epithelioma will be given in connection with the various organs in the ensuing pages.

It will be useful to reiterate here that of the three clinical varieties of epithelioma the burrowing form is not only the most malignant, but gives the worst results after operation. The warty variety is not only the least malignant, but affords the best results when excised.

It may be taken as an axiom that in cases where operations are performed for epithelioma, and as far as could be judged, the incisions were carried wide of the diseased tissues, a quick recurrence of the disease, either in, or near, the cicatrix, or the subsequent enlargement of the lymph glands, may be taken as an indication of a high degree of malignancy, and, as a rule, of the uselessness of further operative interference.

EPITHELIOMA OF LIPS, TONGUE, MOUTH, AND JAWS.

Epithelioma of the Lips. — In this situation it is most common between the thirty-fifth and sixtieth years; it has been recorded as early as the twenty-fifth year and as late

as 102.* Epithelioma is nearly one hundred times more frequent on the lower lip of men than women; in men it is fifty times more common on the lower than the upper lip. When the disease begins on the nether lip near the angle of the mouth it may involve the upper lip: this is rare, but primary epithelioma of the upper lip is very rare. It is a curious fact that epithelioma is more frequent on the upper lip in women than in men. The mode in which the disease attacks the lips is shown in Figs. 101, 102 and 103.

Epithelioma of the lip, when left to run its course, soon infects the lymph glands in the submaxillary region. Occasionally epithelioma will attack the right side of the lower lip but infect the lymph glands in the left submaxillary region and *vice versâ*. No anatomical explanation of this anomaly is forthcoming. The tissues of the lip are gradually destroyed, and the mucous membrane covering the mandible is implicated and the bone itself eroded. In the later stages the glands in the neck form huge masses, which gradually implicate the overlying skin, causing it to ulcerate, and at last the ulcer in the neck and the primary ulcer on the lip join, and as the underlying tissues slough a horrible chasm is formed in the neck, on the floor of which large vessels may be seen pulsating. Death is due to asthenia from repeated hæmorrhage, or from a profuse hæmorrhage, septic pneumonia, or œdema of the glottis. The average duration of life in untreated cases is twelve months.

Treatment.—Epithelioma of the lip in the early stages is easily removed by the V-shaped method, or some one or other of its many modifications.

When the submaxillary or submental lymph glands are enlarged they should be dissected out. When the disease has been allowed to extend until it involves the underlying bone and extensively infiltrates the cheek and neck, operative interference can rarely be undertaken with much prospect of doing good.

After the excision of an epithelioma of the lip, **recurrence** may take place along the edge of the scar, or in the submaxillary lymph glands, and as these enlarge the periglandular tissue also becomes infiltrated with epitheliomatous material, which

* Jalland, *Brit. Med. Journal*, 1891, vol. i., p. 1019.

renders the removal of the diseased tissue a difficult and often impossible task. There is a form of recurrence of epithelioma of the lip which begins near the angle of the mandible, and spreads up each side of the body of this bone in such a way as to resemble a periosteal sarcoma.

The early removal of an epithelioma of the lip is more likely to be followed by good results than in any other part of the body. Occasionally the operation is followed by quick recurrence, even when the primary lesion was very small; but in a large proportion of cases recurrence is delayed two, three, or more years, and in a few cases a cure is brought about. Operations for epithelioma of the lip should have practically no mortality.

Epithelioma of the Tongue.—In this situation epithelioma is most frequent after the age of forty years, but it has been recorded in patients as young as twenty-five, and in individuals of seventy-five years; it is three times commoner in men than women. This predilection of epithelioma for the tongues of men is usually attributed to the habit of smoking.

Epithelioma usually makes its appearance on one side of the tongue, usually near its tip: in a fair proportion of cases it begins on the dorsum, but always distinctly to one side of the middle line, and the beginning of the disease is always at some spot in the anterior two-thirds of the tongue.

In a fair proportion of cases (twenty per cent.) epithelioma of the tongue is preceded by changes known as **leukoplakia** and **ichthyosis**: they are frequently referred to as **precancerous conditions.**

Ichthyotic patches upon the tongue do not necessarily become epitheliomatous in every individual, and when epithelioma attacks an ichthyotic tongue it does not always begin in the ichthyotic patch; indeed, epithelioma is sometimes seen on one side of the tongue and ichthyosis on the other. Even after excision of an epitheliomatous tongue the stump may become ichthyotic and the disease not recur in it.

Epithelioma when it attacks the tongue usually destroys life quickly; the lymph glands in the neck are soon infected, and as a rule, the disease runs its course in about a year. The average duration of life varies from six to twenty-four months.

Death ensues in a large proportion of cases from exhaustion, the result of pain, distress of mind, and difficulty in taking food; in a few it occurs from septic pneumonia, the result of inhaling the fœtid discharges from the mouth; a few die early from hæmorrhage when the ulceration opens up the lingual, or the carotid artery. Death is occasionally due to asphyxia. This may arise from two causes; the epithelioma may extend to the base of the tongue and infiltrate the epiglottis and its folds, producing œdema of the glottis, or, a mass of enlarged glands in the neck may press upon the trachea and cause suffocation.

In addition to the tongue and lips, epithelioma may begin in the mucous membrane of the **cheek**, the **gums, soft palate,** the **tonsils,** and **pharynx.**

In the case of the **cheek** epithelioma is sometimes preceded by a patch of leukoplakia, as in the case of the tongue. The disease often starts close to the angle of the mouth, and extends backwards into the cheek; or it begins in the fold of mucous membrane between the gum and the cheek, and occasionally it starts in the centre of the cheek, often on a level with the meeting-place of the crowns of the upper and lower molar teeth.

Epithelioma may begin in any part of the **gum**, but it appears more frequently in the mucous membrane covering the lower than in that covering the upper alveolar processes. The disease often starts near the **stump of a carious tooth**, and quickly infiltrates the adjacent mucous membrane; thus, whilst it is eroding the bone, it is creeping along the mucous membrane towards the cheek on one side and the tongue on the other. It is astonishing how epithelioma erodes such a firm and compact bone as the mandible. Similar effects may be observed when the disease attacks the gums in relation with the maxilla; as the alveolar process is destroyed the cavity of the antrum is exposed, and a foul ulcerating chasm formed. One of the facts connected with epithelioma of the mucous membrane of the mouth—and it matters little whether the disease begins on the tongue, cheek, hard or soft palate, or gums—is the extraordinary size which the infected lymph glands in the neck sometimes attain, whilst the ulcer scarcely exceeds 1 cm. in diameter. This is worth bearing in mind,

because an enlargement of the cervical lymph glands in individuals past middle age should always induce the surgeon to examine the various recesses of the mouth and fauces for small, inconspicuous epitheliomatous ulcers, and with every care they sometimes escape detection during life. It is necessary to emphasise this, because a good deal has been written about "branchiogenous cancer," or, as it is sometimes called, "malignant cyst" of the neck. The tumour is most commonly observed after the age of fifty, and is deeply seated in the neck, usually near the fork of the carotid; it grows with great rapidity, and in many cases softens in the centre and gives rise to fluctuation. The overlying skin becomes brawny and red, and the resemblance to an abscess is so striking that, in several cases, I have known a knife to be used under this impression. Gradually the implicated skin sloughs, and then an epitheliomatous chasm forms in the neck. Microscopically the tissue of these tumours is characteristic of epithelioma. Some writers are of opinion that these are primary epitheliomata arising in remnants of branchial clefts. My belief is that, in most of the cases, these gland masses are secondary to epitheliomata originating in recesses of the pharynx or naso-pharynx, and the theory that they arise in remnants of branchial clefts is pure fiction. They run a rapidly fatal course: the average duration of life is about six months. These tumours resent interference, and in the few cases where patients have survived operation quick recurrence has been the rule.

Treatment.—The results of the operative treatment of epithelioma of the tongue stand in striking contrast to those which follow operations for this disease when affecting the lower lip.

The manner of removing an epitheliomatous tongue is modified according to the situation and extent of the disease. The excision of the anterior portion of the tongue, or the right or left anterior fourth of the organ when the disease is localised to one side, is an operation devoid of risk or difficulty. When the disease deeply invades the tongue, involves the floor of the mouth, or extends so far backwards that, in order to get beyond the limits of the disease, the surgeon interferes with the pillar of the fauces, then the operation is often hazardous. The chief difficulty is connected with hæmorrhage, and in order to obviate it a variety of methods have been advocated for the

excision of the tongue. Thus some prefer to slowly crush through the tissues with the wire or wire-rope of an écraseur; others use a galvano-cautery; many deliberately cut through the tissues with scissors and seize the divided lingual arteries with forceps. It is a good plan (and one which has in my own practice been very successful) to tie both lingual arteries through incisions in the neck: the tongue can then be cut out with scissors without any risk of hæmorrhage. In this way infected submaxillary lymph glands, if any exist, can be dissected out through the same incisions, and it is sometimes convenient to remove the submaxillary salivary glands. The advantage of preliminary ligature of the lingual arteries is twofold; not only is it a guarantee against hæmorrhage, but it so limits the blood supply of the part that it reduces sloughing and fœtor to a minimum and retards recurrence. The removal of the salivary glands relieves the patient of the profuse salivation which is such a source of discomfort.

When the disease is very extensive it is necessary to acquire space for manipulation by slitting the cheek. When the mandible is involved the diseased part must be excised with the tongue, and in exceptional cases it is necessary to obtain a free removal of the floor of the mouth by means of incisions between the symphysis and the hyoid bone. Mr. Butlin, in his work on the "Surgery of the Tongue," mentions a score of methods that have been employed in dealing with epithelioma of this organ.

It is an important point in operating upon the tongue to avoid the entrance of blood into the trachea, as it is then drawn, during inspiration, into the lungs and gives rise to septic pneumonia. Should blood in considerable quantity get into the trachea it may cause suffocation. To avoid these complications it is useful, in extensive operations on the tongue, to perform laryngotomy and administer the anæsthetic through a laryngotomy tube, and in order to prevent blood from getting into the trachea, the pharynx is plugged with a sponge.

The mortality of operations for the removal of epitheliomatous tongues is not less than ten per cent.; the chief causes of death are hæmorrhage, septic pneumonia, and asthenia.

Although after excision of an epithelioma of the tongue, recurrence in the stump or cervical lymph glands within a

year of the operation is the rule, nevertheless it is in some cases delayed for five and even seven years. It is also useful to bear in mind that, in some cases, where the disease is advanced and too extensive to admit of removal, the pain may be relieved by division of the lingual nerve, and a few patients are rendered comfortable by ligature of the lingual and facial arteries.

It has been already mentioned that epithelioma occurring in the gums will afterwards invade the mandible or maxilla, according to its situation. Although in the majority of instances in which the maxilla is implicated in an epithelioma, the disease begins in the gingival mucous membrane, there is a small number of cases in which patients past middle life complain of pain in the jaw for which no adequate cause can be assigned. Gradually a slight fulness is observed in the infra-orbital region, with perhaps, œdema of the eyelid; the skin becomes brawny, and at last an epitheliomatous ulcer appears in the skin of the cheek, and the antrum is then found to be filled with a tumour. When such a case is submitted to operation and the skin of the cheek reflected, the extensive inroads the disease has been silently making on the surrounding parts is truly extraordinary. The greater part of the maxilla will be found destroyed, and outrunners from the growth will be found in the orbit and among the pterygoid muscles. The skin of the cheek is usually so infiltrated that it must be removed. The successful treatment of such cases demands much boldness on the part of the operator, as he will find it necessary to sacrifice the eye and the orbital contents, the palatine aspect of the maxilla, and a portion of the skin covering the cheek; as a result, a large yawning cavern is left. Life is rarely prolonged, but the patients are spared much pain and discomfort. This is the variety which Reclus* called "Epithélioma térébrant," and is usually rendered in English as "**Boring epithelioma**." It is certainly an excessively malignant and extremely insidious variety of epithelioma.

EPITHELIOMA OF THE ŒSOPHAGUS.

This disease is four times more frequent in males than in females, and is most common between the fortieth and

* *Progrès Médical*, 1876, t. iv., p. 795.

sixtieth years. It has been observed as early as the thirtieth year, and my oldest case was eighty-four. Certain parts of the œsophagus are more liable to be attacked than others; the usual situations are: 1, at the level of the cricoid cartilage; 2, where it is crossed by the left bronchus; 3, at its termination.

Nothing is known of the early stages of œsophageal epithelioma, as it produces few symptoms until neighbouring structures, such as the larynx, trachea, pleura, etc., are implicated.

The disease runs a very rapid course: most cases terminate fatally within a year from the time the patient comes under observation. Death occurs in a variety of ways: inanition and exhaustion are the results of obstruction to the passage of food; pleurisy and septic pneumonia, due to perforation of the pleura and trachea. A fistula between the trachea and œsophagus is the rule in this disease. Mediastinal abscess, which may perforate the pleuræ or pericardium, sometimes forms, and ulceration has been known to broach the aorta. When epithelioma begins at the commencement of the œsophagus, the recurrent laryngeal nerves are apt to become entangled and cause paralysis of the laryngeal muscles.

When the disease occupies the middle and lower parts of the œsophagus, the lymph glands of the mediastinum and lumbar region enlarge. When the upper third of the tube is implicated the mediastinal glands and those at the root of the neck are involved. It does not necessarily follow that the glands nearest the seat of disease are those most enlarged, for it occasionally happens that the neighbouring glands are apparently unaffected, whilst those at some little distance are charged with epitheliomatous material. For instance, in a case in which a man died from a large epithelioma of the middle third of the œsophagus, the mediastinal glands were slightly bigger than usual; but in the neck, immediately above the clavicle, there was one hard gland, the size of a bean, just beneath the skin. The enlargement of this gland was regarded, in the presence of other signs, as an indication of the malignant nature of the œsophageal stricture. Dissemination is rare in epithelioma of the œsophagus.

Treatment.—The peculiar relations of the œsophagus render it impossible to carry out with any prospect of success

excision of an epithelioma. The inability to swallow food and the almost inevitable fate, death from starvation, has induced surgeons to perform gastrostomy. The results of this operation for œsophageal epithelioma are not encouraging.

EPITHELIOMA OF THE LARYNX.

When this disease originates in the mucous membrane of the ventricles, vocal cords, or ventricular bands it is said to be **intrinsic**. When epithelioma arises in the aryteno-epiglottic folds, or the mucous membrane covering the arytenoids or the inter-arytenoid folds, it is said to be **extrinsic**.

In addition, the larynx may be implicated in extensive epithelioma of the tongue, fauces, or upper part of the œsophagus.

Intrinsic epithelioma of the larynx usually commences in one of the ventricles, and is almost invariably of the warty variety; it is particularly rich in cell-nests, and these are exceptionally horny. The papillomatous character of intrinsic laryngeal epithelioma must be borne in mind, or it may lead to grave errors in diagnosis. The laryngeal wart is essentially a disease of children and young adults, whereas epithelioma is an affection of adults, especially men who have passed the meridian of life. A wart-like growth in the larynx of an individual over forty years of life should be viewed with suspicion. As a rule, ulceration and infection of lymph glands occur early in the course of the disease.

Laryngeal epithelioma is usually rapid in its progress; death occurs in from twelve to eighteen months, and is rarely prolonged beyond two years. The fatal result is due to asthenia, which is intensified by the difficulty these patients experience in swallowing, and pneumonia. Actual suffocation is obviated early in the course of the disease by tracheotomy.

Extrinsic epithelioma of the larynx appears to be a far more formidable affection than the intrinsic form. It not only extends more rapidly and infects the lymph glands at a very early period, but implicates the surrounding parts far more extensively than the intrinsic variety; the duration of life is therefore shorter. Dissemination is extremely rare in laryngeal epithelioma.

Treatment.—It is of great importance to recognise early the nature of this grave disease of the larynx: as a rule, there

is little difficulty in appreciating the extrinsic variety, but the papillomatous nature of intrinsic epithelioma of the larynx makes the diagnosis somewhat dubious in the early stages. Thus it is customary when there is an element of doubt as to the nature of a laryngeal growth in an adult, to remove a fragment by means of laryngeal forceps and submit it to microscopical examination.

Acting on the principles that prevail in the treatment of epithelioma in other parts of the body, surgeons have in recent years (following the lead of Billroth, 1873) attempted to cure epithelioma of the larynx by excision. Unfortunately there is very little to urge in favour of complete extirpation of the larynx for intrinsic epithelioma; it has been abandoned by most surgeons in the extrinsic form of the disease, and even for the intrinsic form laryngectomy is fast falling into disfavour. The operation has an excessively high mortality, a very large proportion of the patients succumb to septic pneumonia, and the few that recover are often in a miserable and pitiable condition.

Excision of a lateral half of the larynx for intrinsic epithelioma is a much more successful operation, and this is also true of the operation known as thyrotomy, in which the thyroid cartilage is divided in the median line and the diseased soft tissues are dissected out or destroyed by a galvano-cautery.

Although partial excision of the larynx is a fairly satisfactory operation, the opinion is gaining ground among surgeons that the needs of the patient are in most cases best satisfied by a simple tracheotomy.

EPITHELIOMA OF THE PINNA.

This is a very unusual situation for epithelioma. Some carefully described cases will be found in the records of the Pathological Society, London. The disease may begin in any part of this appendage. So far it has been mainly observed in individuals advanced in years, and attacks men and women equally. After destroying the pinna it attacks the bony wall of the skull. Its disastrous effects are well illustrated in a case described by Hulke.*

* Trans. Path. Soc., vol. xxvi. 187. (*See also* Bowlby, *ibid.*, vol. xxxv. 330, and R. Williams, xxxv. 331.)

CHAPTER XXII.

EPITHELIOMA (*concluded*).

EPITHELIOMA OF THE GENITO-URINARY ORGANS.

Epithelioma of the Scrotum or Chimney-Sweep's Cancer appears on the scrotum in the form of a wart or warts; they are often spoken of as soot-warts, for they not only occur on the scrotum of the chimney-sweep, but are met with in men who are brought much in contact with soot. In many cases the scrotal wart is harmless, but in a certain proportion of cases it grows slowly, or if they are multiple, one of them becomes more prominent than its fellows and ulcerates. The ulceration, at first limited to the wart, extends to the surrounding skin and forms an epitheliomatous ulcer, which will extensively involve the skin of the scrotum, and spread thence to the skin around the anus and pubes, and even to the thigh.

In some cases the ulceration, instead of spreading widely, involves the tissues deeply, so that the tunica vaginalis is exposed and sometimes implicated in the disease; but this is rare.

The inguinal glands become infected and attain a large size, then slowly involve the skin, break down, and ulcerate; this process often leads to the formation of deep excavations in the groin, and it not infrequently happens that the femoral, or external iliac artery, or both will be seen exposed and pulsating on the floor of one of these deep pits. It is not uncommon in such cases for the ulceration to open up one of these large vessels, and violent fatal hæmorrhage is the result.

It has been stated by several writers that in chimney-sweeps epithelioma may begin in the inguinal glands. There can be little doubt that such views arise in imperfect observation. In some of these cases the lesion on the scrotum assumes the form of a small hemispherical pimple no larger than a split pea, so small indeed that I have known them to escape very vigilant eyes; and yet such a small lesion will

cause the inguinal glands to grow into a mass as big as two fists. Two such cases have come under my own notice.

A very remarkable feature connected with epithelioma in English chimney-sweeps is, that they are not more prone to it in other parts of their bodies than those persons who follow other occupations; yet the scrotum, which in other individuals is the part least disposed to epithelioma, is in sweeps so very liable to become the seat of this disease. No answer to this problem is at present forthcoming; neither has anyone succeeded in assigning a reason why it is so very much more frequent in English chimney-sweeps than in sweeps of other nations.*

There is good reason to believe that tar and paraffin are liable to produce an affection of the scrotum, similar to the epithelioma of chimney-sweeps. Such cases are, however, very rare. The literature has been summarised by Butlin.†

Treatment.—This consists in the free removal of the disease whenever it is practicable; the very best results follow the excision of a soot-wart in its earliest stages. When the disease is permitted to extend deeply into the tissues of the scrotum so that it is necessary to excise one or both testicles with the scrotum, and perhaps a portion of the neighbouring skin, it is not probable that lasting benefit will follow the operation. In cases where soot-warts have been early and thoroughly removed there is good ground for the belief that a cure is sometimes brought about.

Epithelioma of the Penis and Urethra.—Epithelioma may attack the prepuce or the epithelial investment of the glans. The disease is excessively rare before the age of thirty years, and appears to be most common between the ages of fifty and seventy. There is reason to believe that phimosis, congenital and acquired, is a condition that favours the development of epithelioma of the penis. It is certainly true that phimosis, by leading to the retention of smegma, is indirectly a cause of penile warts not only in men but other mammals, especially horses and bulls. Mention has already been made of the fact that penile warts are particularly prone to be transformed into wart horns, and cases have been recorded in which men

* Butlin, *Brit. Med. Journal*, 1892, vol. i. 1341.

† *Brit. Med. Journal*, 1892, vol. ii. p. 68.

have had a wart horn on the penis for several years, and at length the base has ulcerated and epithelioma developed. Gould* has described a good example of this, which is further peculiar in that the wart and ulceration appeared to start in a scar left by circumcision. It must be remembered that epithelioma may begin as an ulcer on the penis, but the warty variety is by far the most frequent. When the disease begins as an ulcer it is very liable to be mistaken for some manifestation of primary or tertiary syphilis.

Epithelioma in whatever form it commences gradually involves and as surely destroys the penis, implicates the scrotum, and infects the inguinal lymph glands on each side; in many cases the lumbar glands also become infected. Secondary deposits seem to be rare. The duration of life in this disease is very uncertain. As a rule, its course is short—six months to a year; but in many cases it is much longer. When the urethra is involved this passage is liable to become narrowed, and not infrequently urinary fistulæ add to the patient's misery.

Epithelioma of the Urethra.—Judging from the scanty records obtainable, primary cancer of the urethra is very rare. It is possible that the disease is more frequent than we imagine, as it is an affection very likely to be mistaken for perineal abscess. The disease in all the recorded cases commenced in that section of the tube which is in relation with the bulb.

In the reported cases where the details are given with sufficient care, and the nature of the tumour is confirmed by microscopical examination, the features of the disease are as follows :—

The patients were men between the ages of fifty and seventy-three; they had all suffered from gonorrhœa in youth, but urethral stricture did not follow as a sequence. The trouble began by the formation of a hard mass in the perineum in relation with the bulb and corpora cavernosa. This mass led to interference with micturition, and attempts to pass a catheter provoked intense pain and free hæmorrhage from the urethra. The obstruction increased until the urethra became impermeable to instruments, the overlying skin was involved, and fistulæ formed in the perineum. In most of

* Trans. Path. Soc., xxxviii. 355.

the cases perineal section was performed, and the cut surface of the tumour had a greyish-white appearance, and the tissue was extremely brittle. This tissue presented under the microscope the characters typical of squamous-celled epithelioma with abundant cell-nests. As a rule, the lymph glands are not enlarged, and secondary deposits are rare.*

Treatment.—Epithelioma of the penis is treated by partial or complete removal of this organ according to the extent of the disease. Partial removal of the penis, whether by knife, cautery, or écraseur (of the three methods that in which the knife is employed is the best) is a simple proceeding, and entails but little risk so long as the cut end of the urethra is stitched to the skin. When the disease is so extensive as to demand complete removal of the penis, the operation which gives best results consists in excising not only the corpus spongiosum and corpora cavernosa, but the penile crura as well by detaching them from the pubic arch. The urethra is brought out and attached to the incision in the perineum. The published results of this complete operation are very good, and my experience of it has been in every way satisfactory. The ultimate results of amputation of the penis are more favourable after partial than after complete removal of organ, simply because the disease is not so advanced when partial amputation is sufficient.

In regard to epithelioma of the **urethra,** sufficient evidence is not yet accessible to enable a decision to be formed as to the most appropriate treatment.

Epithelioma of the Bladder.—Epithelioma occasionally attacks the vesical mucous membrane, and it does not appear to exhibit a predilection for any particular part of it. From what is known of the habits of this disease elsewhere, it would be anticipated that in a certain proportion of cases it would begin at the orifices of the ureters. This is actually the case; but it must not be assumed that when the ureteral orifices are found involved in the late stages of the disease that the epithelioma originated at these orifices.

Epithelioma of the bladder seems to be more common in women than in men. The signs of its presence are hæmaturia,

* J. Griffiths, Trans. Path. Soc., vol. xl. 177; Marcus Beck, "International Clinics," vol. ii. 256; and Witsenhausen, Bruns, *Beiträge*, bd. vii. 571.

painful micturition, and cystitis. Such signs are, of course, equivocal, and it is usual to demonstrate its existence by means of the cystoscope, or a cystotomy in men, and dilatation of the urethra in women. It is very unusual before the age of forty. Death results from renal complications, exhaustion from repeated bleeding, bodily suffering, and frequent micturition.

Epithelioma of the Female Genitalia.—The female genital organs liable to epithelioma are the labia majora and minora, the clitoris, vagina, and that portion of the cervix of the uterus which projects into the vagina.

Collectively, epithelioma of these parts is by no means infrequent; when each part is individually considered, epithelioma is somewhat rare. This disease is more frequent in the labia than in all the parts of the genital passage taken together.

The Labia Majora and Minora.—Epithelioma may begin in any part of the labia; its course, relation to lymph glands, and modes by which it causes death are very similar to epithelioma of the scrotum. It is a curious fact that two cases of cancer of the labium have come under my notice in patients who were wives of chimney-sweeps.

The Clitoris.—Epithelioma of this organ is very rare indeed. In the only case that has come under my notice the disease began at the extremity of the clitoris; the lymph glands in each inguinal region were enlarged.

Vagina.—Epithelioma may make its appearance in any part of the mucous membrane lining this canal, but it is much more liable to begin at the junction of the vagina with the vulva, and on that portion which is reflected over the uterine cervix. In many cases in which the vulval extremity of the vagina is invaded by epithelioma the disease begins at, or in close proximity to the urethral orifice and extends into the vagina. In such cases the inguinal lymph glands are infected very early, and the ulceration destroys the vesico-vaginal septum and perforates the posterior wall of the bladder.

When the posterior wall of the vagina is the seat of epithelioma the recto-vaginal septum becomes infiltrated; ulceration ensues, and leads to the formation of a recto-vagina, fistula.

It is very remarkable that in its early stages epithelioma produces such slight inconvenience that the patients rarely

seek advice until the disease has long passed beyond the bounds of operative interference. This is especially the case when it attacks the vaginal portion of the **cervix uteri**, and it is on this account that so few opportunities arise for studying its early stages.

The epithelial investment of the uterine cervix derived from the vagina is continuous, at the margin of the os uteri, with the columnar cells lining the cervical canal. The layer of squamous epithelium covering the vaginal surface of the cervix has been compared to "a tailor's thimble which fits on the lower end of the cervix proper" (Williams). Epithelioma may begin at any point from the os uteri to the vaginal vault. In the earliest stages at which it comes under observation the disease assumes the form of a circular ulcer with raised and everted edges, as is seen in many epitheliomata of the lips: sometimes it erodes deeply from the beginning; and exceptionally it forms luxuriant cauliflower excrescences. Thus in its naked-eye characters, as well as in its minute structure, epithelioma of the vaginal portion of the uterine neck does not differ from this form of tumour in other regions of the body. Gradually the disease extends from the cervix to the vaginal wall; it rarely extends into the cervical canal, but it quickly involves the connective tissue of one or both broad ligaments. Gradually the structures implicated by the disease ulcerate and necrose. When these destructive changes involve the anterior vaginal wall the bladder is apt to be perforated, and a urinary fistula adds to the misery of the patient. In a similar way, when the disease invades the posterior wall of the vagina the rectum may be perforated. In some cases, in the later stages, when the upper segment of the vagina is destroyed, the bladder and rectum may both communicate with a foul ulcerating chasm.

Epithelioma of the cervix is unusual before the age of thirty, and is most common between thirty-five and fifty-five.

Treatment.—When epithelioma attacks the **labia** and its nature is recognised before it has had time to spread very extensively, the affected tissues must be freely removed with knife and cautery. Should the inguinal lymph glands be enlarged, they must be dissected out.

In the rare instances in which the **clitoris** is attacked with

epithelioma it is the usual practice to dissect out this appendage with its crura. In the case of the **vagina** the patients very rarely submit themselves to observation at a sufficiently early stage of the disease to allow a satisfactory operation to be performed. When epithelioma spreads to the recto-vaginal, or the vesico-vaginal septum, the removal of the disease will lead to the formation of a fistula between rectum and vagina, or between bladder and vagina, and thus anticipate, in a measure, those distressing complications which are almost sure to be produced in the course of the disease.

When epithelioma attacks the **vaginal portion of the uterine cervix** and is seen early, prompt removal of the cervix will do much to delay the progress of the disease. Operations of this kind have a limited application, because they can only be carried out when the disease is very restricted, on account of the close proximity of the bladder to the anterior surface of the cervix. Recurrence usually begins at the cut edge of the vaginal mucous membrane and spreads into the vaginal fornices. Removal of a limited epithelioma from the cervix is attended with very little risk to life.

EPITHELIOMA OF THE ANUS

is about equal in frequency to this disease in the scrotum and labia. It is more frequent in women than in men, and rarely begins before the fortieth year. In about half the cases the inguinal glands are affected on one or both sides. When seen in the early stages and its nature recognised, epithelioma of the anus admits of free and complete removal, and the results of such interference are admirable. In cases where the disease runs its course life is rarely prolonged beyond twelve months; whereas in cases where the growth is satisfactorily removed life has been prolonged several years (five to eight). In cases where the disease cannot be extirpated, the patients are sometimes made more comfortable by diverting the course of the fæces.

EPITHELIOMA OF SCARS.

Surgeons have long been aware that scars left by **burns** are liable to become the seat of epithelioma, especially when situated on the limbs. Scars upon the legs are more prone to

this disease than those on the arms. When epithelioma attacks a scar the change usually begins near the junction of the skin and cicatricial tissue; in some cases the disease extends along this margin and encroaches but little upon the skin on one side, or the scar on the other; more commonly the whole cicatrix is quickly involved, and a large ulcerating surface with raised rampart-like edges results. Histologically, this variety of epithelioma is identical with that which occurs on the lips; it involves adjacent tissues and the underlying bone, infects the neighbouring lymph glands, and recurs locally after removal. When a limb is the seat of epithelioma, and amputation is performed, the disease is apt to recur in the stump.

Scar epithelioma is usually less malignant than the same disease in the lips, tongue, anus, or scrotum. Many chronic ulcers occurring in connection with scars in adults are often clinically described as epitheliomata. In collecting evidence relating to this question no case should be classed as a *scar-epithelioma unless the diagnosis is confirmed by a careful histological examination.*

Lupus scars are also liable to epithelioma. Bayha* has published some good observations, in which he points out that this sequel of lupus is most prone to occur between the fortieth and the sixtieth years; it has, however, been observed in a patient of fourteen years. Epithelioma of lupus scars has been most frequently seen on the face, and in a very large proportion of cases it affects the skin near the malar bone.

Treatment.—When epithelioma attacks scars situated on the limbs it is the usual practice to perform amputation and the results are satisfactory.

When the disease occurs in scars seated on the face, free removal with the knife and sharp spoon, accompanied by thorough destruction of the implicated tissue by means of the cautery, gives the best results.

EPITHELIOMA OF THE CONJUNCTIVA.

It is very rarely that epithelioma attacks the conjunctiva; when it occurs in this mucous membrane the disease makes

* Bruns, *Beiträge*, bd. iii., s. 1; and Berry, Trans. Path. Soc., vol. xlii. p. 308.

its appearance as a pimple, or phlyctenule, at the corneo-sclerotic margin on the outer side of the eyeball. The majority of cases of epithelioma of the conjunctiva occur after the fiftieth year, but it has been reported in a patient twenty-seven years of age, in whom it supervened upon an injury; the man received a scratch upon the conjunctiva from a branch of a tree, and a few months later a small tumour arose between the caruncle and the corneo-sclerotic margin.*

In the early stages epithelioma restricts itself to the conjunctiva, but infiltrates the whole thickness of this membrane; even in the later stages it shows little tendency to implicate the cornea or sclerotic, but invades the eyeball at the point of junction of the cornea and sclerotic.

Two examples of conjunctival epithelioma that came under my own observation occurred in the cicatrices left by injuries caused by lime. In one case the eye had been useless many years.

The tumour rarely exceeds a nut in size, but before it attains the dimensions of a pea it ulcerates and assumes the appearance characteristic of an epitheliomatous ulcer elsewhere. When the tumour is excised, quick recurrence is the rule. When it infects lymph glands it is the pre-auricular set which enlarge, and afterwards those in the submaxillary region.

Treatment.—As the disease usually recurs very quickly when the conjunctiva alone is excised, it appears advisable to remove the disease thoroughly by excising the eyeball with the conjunctiva. When the eye is useless in consequence of an old injury, such as a lime-burn, there should be no hesitation in sacrificing the globe. If the pre-auricular and submaxillary lymph glands are enlarged, they should be enucleated at the same time as the globe.

EPITHELIOMA OF THE GALL BLADDER.

There is a fair number of cases recorded in medical literature under the name of cancer of the gall bladder, but it is an unfortunate circumstance that very few of the specimens have been submitted to careful microscopical examination. Of the few that have been thus investigated

* Lagrange, "De l'épithélioma de la conjunctive bulbaire." Soc. Française d'Ophtalmologie, 1892, p. 71.

the tumours seem to be epitheliomata rather than cancers; hence it will be convenient, until more careful reports are forthcoming, to deal with "cancer" of the gall bladder in this chapter.

The disease presents itself as a uniform thickening of the walls of the gall bladder, which causes it to assume a pyriform

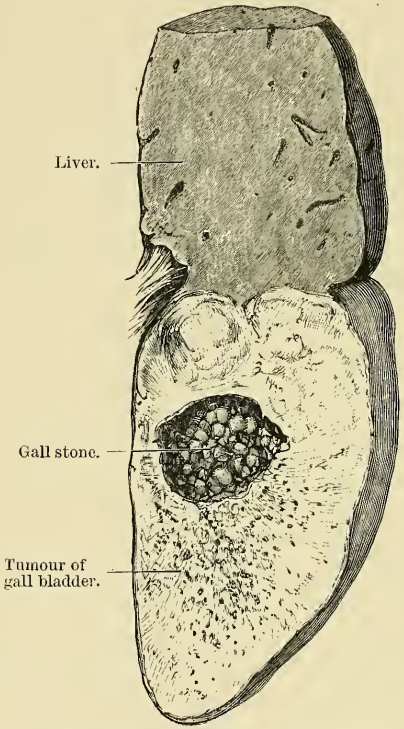

Fig. 105.—Epithelioma of the gall bladder. (*Museum, Middlesex Hospital.*)

shape and project from the under surface of the liver. In some few cases the tumour has attained the dimensions of a large fist. In the early stages the disease is confined to the gall bladder, but later it invades the liver, and sometimes the duodenum and stomach. When the tumour is bisected it presents the characters displayed in Fig. 105. In the middle of the tumour there is usually a chamber containing biliary calculi, representing the original cavity of the gall bladder.

It is an interesting fact that calculi are found in more than three-fourths of the cases.

Dissemination is rare. When it occurs, the secondary nodules are found in the liver. In several cases the peritoneum has been infected, its surface being dotted with an innumerable number of minute miliary knots. A case of this kind came under my own notice; there was hydroperitoneum. The lymph glands in the hilum of the liver are often infected.

The chief clinical features of "cancer" of the gall bladder may be thus summarised:—

The disease is most frequent between the fortieth and sixtieth years. Jaundice is the exception, and probably occurs in less than one-third of the cases. The chief signs are the presence of a hard but tender tumour in the region of the gall bladder accompanied by epigastric pain.*

* Musser has collected the chief cases in the *Boston Med. and Surg. Journal*, December 15, 1889; and Norman Moore, "Visceral New-Growths," p. 39.

CHAPTER XXIII.

ADENOMA AND CARCINOMA.

An **adenoma** may be defined as a tumour constructed upon the type of, and growing in connection with a secreting gland, but differs from it in being impotent to produce the secretion peculiar to the gland it mimics. (Fig. 106.)

Adenomata occur as encapsuled tumours in such glands as the mamma, parotid, thyroid, and liver; in the mucous membrane of the rectum, intestine, and uterus they are pedunculated. A single adenoma may be present, but not infrequently two or more exist in the same gland. In the case of the intestine a score or more may co-exist in the same individual. In size they vary greatly; some are no larger than peas, whereas in certain situations—*e.g.*, the mamma—an adenoma will occasionally attain the dimensions of a man's head, and in the case of the ovary an adenoma weighing forty pounds is no rarity; in such the acini are usually distended with fluid.

The effects of adenomata depend mainly upon the situations in which they grow. The following statements are true for all:—When completely removed there is no fear of recurrence; they do not infect neighbouring lymph glands, nor give rise to secondary deposits. When an adenoma causes death, it is in consequence of mechanical complications, depending on the situation and size of the tumour. The dangers to be apprehended from adenomata will be mentioned with each species.

Although the distinguishing structural peculiarity of an adenoma is the presence of epithelium disposed as in a secreting gland, the connective tissue (stroma) entering into its composition must also be taken into account. In many adenomata the epithelial element is the most conspicuous; in others the connective tissue is out of all proportion to the epithelium, and occasionally preponderates to such a degree that the tumour from some writers receives the misleading name of "adeno-sarcoma." When the epithelium-lined spaces are

distended with fluid the tumour is spoken of as a cystic adenoma (adenocele).

The chief species of adenomata are :—

Mammary.	Renal.
Sebaceous.	Ovarian.
Thyroid.	Testicular.
Pituitary.	Gastric.
Prostatic.	Intestinal.
Parotid.	Fallopian.
Hepatic.	Uterine.

Carcinomata are tumours that always grow from pre-existing gland tissue and mimic the parent gland, but they

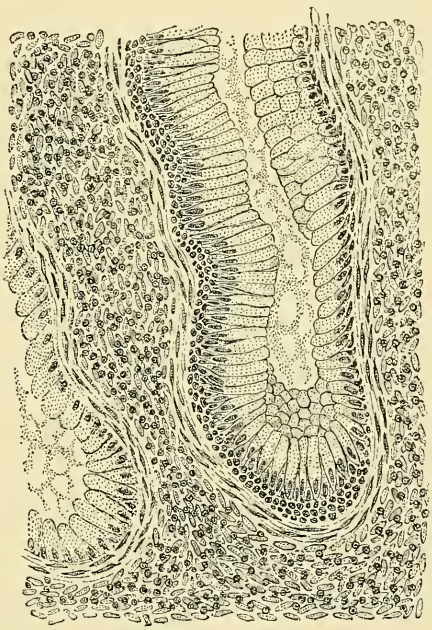

Fig. 106.—Section of an adenoma from a child's rectum. (*Highly magnified.*)

differ from adenomata in the fact that the structural mimicry is incomplete; the epithelial cells, instead of exhibiting the regular disposition so constant in those tumours, are, in the cancers, collected in the acini and ducts in irregular clusters, or fill them so completely as to give rise to the appearance of

sections of columns of epithelial cells when seen under the microscope. (Fig. 108.)

As in the case of adenomata, there are species of carcinomata depending upon the relation of the epithelium to the stroma of the tumour. Each of these will be considered when the various species are described. Carcinomata arise in every secreting gland that gives rise to an adenoma; but they are very common in some glands and exceedingly rare in others; indeed, those glands which are the most frequently affected with adenoma are the most liable to carcinoma, with the exception of the ovary. The chief species of carcinoma are:—

Mammary.	Renal.
Sebaceous.	Ovarian.
Thyroid.	Testicular.
Prostatic.	Gastric.
Parotid.	Intestinal.
Pancreatic.	Fallopian.
Hepatic.	Uterine.

Cancers are not encapsuled, but infiltrate surrounding tissues and pass beyond the glands in which they originate; they are very prone to involve the superficial tissues, ulcerate, and quickly infect the **lymph glands** in their neighbourhood. A marked feature of carcinomata is their great tendency to undergo degenerate changes and necrosis. The rapidity with which the lymph glands are infected is due to the abundance of lymphatics in most species of cancer.

Dissemination. — Cancers are exceptionally prone to become disseminated; the secondary growths may make their appearance in any organ or tissue, and not infrequently in the bones. The cancer germs that give rise to these secondary nodules are transported by lymph and blood-vessels, and when these minute emboli are lodged in suitable situations they multiply, giving rise to a growth which, in its histological features, exactly resembles the parent tumour. So faithful is this reproduction that the nature of the primary tumour can often be correctly inferred from a microscopic examination of a secondary nodule.

The amount of dissemination varies greatly. In some cases secondary deposits will be found only in the liver, whilst in

another and apparently identical case, in so far as the structure of the tumour is concerned, secondary knots occur in almost every organ of the body, including the skeleton.

Secondary deposits of cancers are not always so small as merely to merit the name of knots, but form occasionally tumours of some magnitude, and may even excel in size the primary tumour.

MAMMARY ADENOMA AND CARCINOMA.

Adenomata.—There are two varieties of mammary adenoma:—1, *Fibro-adenoma*; 2, *Cystic adenoma* (adenocele).

1. **Fibro-adenomata** occur as spherical or oval tumours, furnished with distinct capsules, lodged in the superficial parts of mammæ; exceptionally they may be situated deeply in the breast substance. As a rule, they are firm and elastic to the touch, and slip about under the examining finger. It is not rare to find a fibro-adenoma in each mamma, but it is unusual to find more than one tumour in the same gland. When occupying a superficial position they will, even when small, project the skin so as to cause an irregularity in the contour of the breast; very exceptionally they may be pedunculated. Although the majority of mammary adenomata do not exceed the dimensions of a walnut or a Tangerine orange, some are as big as cocoa-nuts.

Structurally they consist of fibrous tissue in which glandular acini are embedded; the tumour itself is isolated from the surrounding gland tissue by a thick capsule.

2. **Cystic Adenomata.**—These tumours often attain a very large size, and specimens now and then come under observation weighing ten or twelve pounds. Like fibro-adenomata they are encapsuled, and have a fibrous stroma with glandular acini embedded therein; but the acini are dilated so as to form epithelium-lined cavities, from the walls of which papillomatous processes project and form what are known as intracystic growths. The size and number of the cavities and the amount of intracystic growth vary greatly in different cases. This variety of adenoma grows slowly, and produces very little disturbance of the health: by pressure it induces atrophy of the true gland tissue, which in some cases becomes reduced to exceedingly small proportions.

Adenomata occur at any age from puberty to the fiftieth

year—that is, during the period of sexual activity. Fibro-adenomata are most common between the ages of twenty and thirty, whereas the cystic adenomata are most common after the thirtieth year. The small fibro-adenomata are frequently sources of pain and inconvenience, especially during menstruation. Most patients experience pain and discomfort when the tumour is handled. Both varieties of mammary adenomata occasionally occur in young men.

Cystic adenomata are rarely a source of pain, but they may become inconvenient when very large. In a case under the care of Stanley the patient had had a tumour of the breast twelve years. It gradually became pendulous, and when she sat the breast rested in her lap. At last the integument sloughed; the breast was then removed by cutting through the pedicle.

It is not uncommon to find in the breasts of unmarried women between the twenty-fifth and the thirty-fifth years, small rounded bodies that are extremely painful when pressed. These often convey to the finger an impression similar to that imparted by a small fibroma. They are most common around the periphery of the areola, but they occur in all parts of the breast. When dissected out they have a corymbose appearance, and are composed of tiny cysts continuous with the mammary tissue. They are often a source of distress to nervous women; otherwise they are of no importance.

Carcinomata.—There are two varieties of mammary cancer—namely, *acinous cancer* and *duct cancer*.

1. **Acinous Carcinoma.**—This variety presents much histological diversity, which has led to great confusion in surgical writings. In the most typical form it occurs as a solitary hard tumour (so hard as to obtain the name of scirrhous cancer) situated at the base of the nipple; but it may occur at any part of the gland, even at its periphery. When the tumour is near the areola it will often induce retraction of the nipple; when situated in other parts of the breast it will lead to dimpling and puckering of the overlying skin.

On section such a tumour has the appearance and consistence of an unripe pear; microscopically, it will be found to consist of columns of epithelial cells, disposed like the lobules of the gland, embedded in dense fibrous tissue. The tumour has

no capsule, and fades away indefinitely into the surrounding tissues. When the parts beyond the tumour are examined, isolated collections of cells will often be detected.

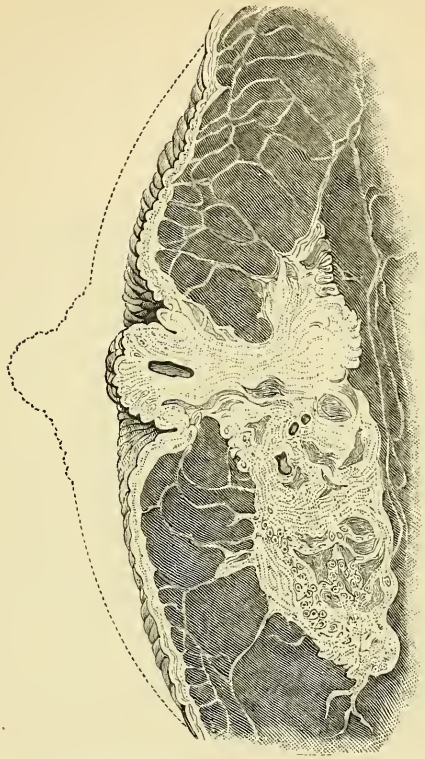

Fig. 107.—Cancer of the breast; the dotted line indicates the extent to which the nipple and areola have retracted.

In other cases the tumour will be only moderately firm, and on section exhibit a succulent appearance. When microscopically examined it presents alveolar spaces lined with epithelium, here and there raised into irregularly-shaped heaps. Such cases are difficult to distinguish from adenomata; but when the sections are attentively examined, parts will be found in which the alveoli are completely filled with irregularly-shaped epithelial cells.

In many examples of mammary cancer the tumour, when bisected, appears to the naked eye merely like a tract of

cicatricial tissue, and feels as hard as cartilage; when examined microscopically it will be found to consist of strands of fibrous tissue enclosing here and there a few epithelial cells. This variety is sometimes spoken of as "withering" or contracting scirrhus; it runs a much slower course than the preceding kinds, and gradually, by its contraction, causes the gland to shrivel, so that at length the patient presents an appearance as if the breast had been removed. Some of these cases have been known to last ten and even fifteen years.

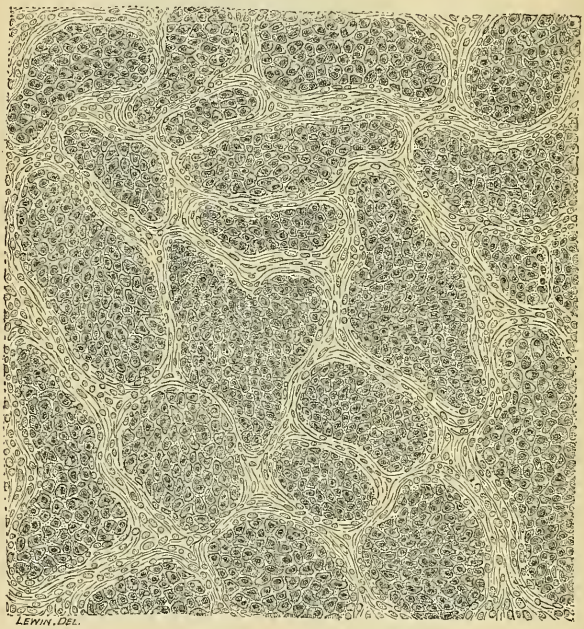

Fig. 108.—Section from a mammary cancer. (*Highly magnified.*)

Clinical Features.—Acinous cancer of the breast never develops before puberty, and is very rare before the age of thirty; it is most common between forty and fifty; after fifty it gradually becomes less frequent, and is rare after seventy. I have seen it in a woman ninety years of age.

This variety of breast cancer occurs in the single as well as the married; in the sterile as well as in those who have had many children; in women who have nursed their offspring and in those who have never given suck. It also attacks the male

breast. Mammary cancer is one hundred times more frequent in women than in men.

It usually attracts attention as a circumscribed hard lump in the mamma; it never forms a large tumour—indeed a mammary cancer rarely exceeds the dimensions of a fist. The rate of growth may be slow, often extremely slow, especially in old individuals. When cancer appears during lactation it progresses with frightful rapidity.

As the tumour increases in size it infiltrates surrounding tissues, becomes adherent to the fascia of the pectoral muscle, and even infiltrates the muscle; at the same time it implicates the subcutaneous tissue. These infiltrated tissues shrink and cause the cancerous breast to become smaller, often much smaller, than its fellow. This fact is illustrated by Fig. 107. The general shrinking of the breast is an important factor in diagnosis, and must not be confounded with *retraction* of the nipple, which is of no diagnostic import, as it occurs under a variety of conditions.

Lymph gland infection occurs early in cancer, and is an important clinical sign. The glands of the axilla which run parallel with the free border of the greater pectoral are first affected, but the infection quickly extends to and involves the whole set, and in later stages, the glands lying in the posterior triangle of the neck immediately above the clavicle enlarge.

It by no means follows that because a tumour of the breast is unassociated with large lymph glands the tumour is not a cancer. By the time the glands are sensibly enlarged the tumour has made its way towards the surface, and at last the skin involved in the growth ulcerates. The advent of ulceration is heralded by a purplish or bluish appearance of the skin, which sometimes resembles a recent cicatrix with veins radiating from it, or the surrounding skin may be dotted with small knots of the size of a split pea or even larger.

After the skin breaks, the ulcer tends to spread, and soon assumes the typical appearance of a cancerous ulcer: its edges are raised and rampart-like, and surround an irregular depression, the floor of which is formed of firm granulations, discharging a foul ichorous or blood-stained fluid.*

* T. W. Nunn, in his work, "On Cancer of the Breast," London, 1882, gives some admirable and life-like illustrations of the various stages of mammary cancer.

Pain.—There is no symptom more variable in mammary cancer than pain. A large proportion of patients experience no painful sensations whatever, and are absolutely ignorant of the presence of any disease in the breast until their attention is arrested by some irregularity in its outline, or some marked difference in the comparative size of the two breasts, or it is accidentally observed by a friend. In others the pain is so severe that the patients suffer torture so intense that only the imagination can suggest parallels. In some the pain is localised, but in others it radiates from the tumour to the surrounding parts. Pathology has totally failed to furnish an explanation why, in two patients of about the same age, temperament, and character, each having a tumour in the breast in corresponding situations, and in structure identical, one should suffer anguish too terrible to describe, and the other be absolutely free from pain, and often devoid even of any feeling of discomfort.

Concurrently with, but more frequently subsequent to, infection of the lymph glands secondary deposits occur in the viscera, especially the liver and lung; but any organ may be the seat of deposit.

When the liver is attacked it enlarges, and there may be hydroperitoneum, rarely jaundice; deposits in the lungs and pleuræ set up pneumonia and pleurisy. When effusions occur in the pleuræ, peritoneum, or pericardium, as a result of cancerous infection, the fluid is often blood-stained.

Secondary deposits in the brain give rise to mental alienation and coma. Deposits in the bones cause "spontaneous" fracture, and when the vertebral column is implicated paraplegia preceded by acute suffering is the usual consequence. Enlarged glands and secondary deposits may so involve large vessels and lymphatic trunks in the axilla as to produce solid œdema of the arm.

It must also be remembered that in the late stages of the disease the tissues covering the thorax may be infiltrated, and this local extension may implicate the ribs and directly infect the pleura.

One of the rarer effects of secondary deposits is when they break out in a great number of small knots over the skin on the front of the chest and both breasts, and induce such

PLATE V.—Cuirass Cancer. The Right Breast had been amputated two years. The Right Arm is in the condition known as "Lymphatic" Œdema.

induration of the skin that it becomes so rigid as to resemble a firm leather shield, a condition which has earned for it the name of "cancer en cuirasse." In this extreme condition the skin is so firm and hard that it is impossible to wrinkle it. (Plate V.) This peculiar condition is probably due to cancerous invasion of the cutaneous lymphatics.

As the cancer extends locally and ulcerates, and more especially when there is evidence of secondary deposits, the patient's health begins rapidly to decline and the tissues to waste. It is, however, astonishing how women with breasts infiltrated with cancer, or eroded by large and foul ulcers, will sometimes be able to get about and busy themselves with household matters; and this state of things will continue for many months, perhaps until the supervention of pleurisy, pneumonia, or some complication due to the dissemination of the cancer incapacitates them and extinguishes life.

Lymphatic Œdema. — This occasional complication of mammary cancer must be considered on account of the inconvenience and distress it produces. It is a condition which cannot be mistaken. The œdema usually becomes manifest in the skin about the shoulder, and gradually extends to the skin of the arm, and in due course involves the forearm and hand; the skin covering the scapula is also implicated. The limb in typical cases has a swollen appearance as though anasarcous, but when the skin is pressed, instead of pitting on pressure it will be found firm, brawny, and unyielding.

The limb grows extremely heavy, and the patient finds it necessary to support it in a sling; exceptionally the weight of the limb prevents the patient from taking walking exercise, and usually produces a moderate degree of lateral curvature of the spine. The connective tissue may be so infiltrated with lymph that the skin becomes so tense as to prevent movement at the wrist, elbow, and shoulder; under such conditions the arm resembles a cast rather than a living limb, and is absolutely useless.

When the tissues of such a limb are examined immediately after death, it will be noticed that the increase in size is due to infiltration of the subcutaneous tissue with lymph, which causes the cut surface to resemble in colour and in texture the pulp of a succulent orange, and large quantities of lymph

flow from the incisions. The muscles are smaller than natural and infiltrated with fat. In the character of the fluid which exudes from the limb, and the firmness of the infiltrated connective tissue, it resembles the œdema characteristic of myxœdema.

In the condition we are considering, the obstruction to the lymphatic circulation of the upper limb is due to the pressure of lymph glands infiltrated with cancer, or to secondary nodules lying in the course of the main lymphatic channels at the apex of the axilla. Exceptionally it complicates the rare form of cancerous dissemination known as cuirass cancer.

Lymphatic œdema of the upper limb may supervene in patients with cancerous breasts who have never been submitted to operation, in those in which the axillary lymph glands were removed when the breasts were amputated, and in those whose axillæ were not interfered with. Many more cases have come under my notice in the right than in the left arm. Pain is experienced in the limb by most of the patients, and it is often very severe. This is due not to the œdema, but to the enlarged glands or cancerous nodules pressing on the cords of the brachial plexus or their branches.

2. **Duct Carcinoma.**—Towards the approach of the menopause the breast enters into a resting stage; its glandular structures atrophy, and nothing but ducts remains.

Breasts in this condition often present on their deep surfaces large numbers of cysts varying in size from a mustard seed to a cherry. These are often called *involution* cysts, and are filled with mucoid fluid which causes them to assume a bluish tint when the breast is examined after its removal from the body. The cysts are most abundant on the deep surface of the gland.

Cystic breasts of this kind are most frequently met with between the forty-fifth and fifty-fifth years. In sterile women they occur somewhat earlier, and as a rule, both breasts are affected. When cystic disease of this kind is more advanced in one breast than the other, it is apt to be mistaken for diffuse cancer. It is quite exceptional for this variety of cystic disease to give rise to pain. Cystic mammary glands of this character require attentive study because the walls of the dilated ducts are occasionally the starting-points of cancer.

In rare instances villous processes, or papillomata, sprout from the walls of such cysts, particularly when the cysts represent dilated lacteal sinuses.

When cancer arises in dilated mammary ducts it is now customary to speak of it as **duct cancer**. This variety occurs most frequently in the terminal ducts and especially in the ampullæ (lacteal sinuses), usually as a single tumour: occasionally several isolated nodules are present in the same gland. The tumour is in some cases no larger than a walnut, but may be as big as a child's fist. When situated near the skin it assumes a deep red or even purple colour.

Seen in section, the cancer will be found provided with a distinct capsule (the dilated duct), whilst the mass within projects as a soft red outgrowth from the cyst-wall: sometimes this is so large as completely to occupy the cavity. When this intracystic growth is examined microscopically it will be found to consist of glandular spaces lined with regular columnar or subcolumnar epithelium. Sometimes the intracystic mass takes the form of villous processes, like those sometimes met with in the bladder. Such are termed **duct papillomata** of the mamma. (Fig. 89).

Clinical Features.—Duct papilloma and duct cancer appear most frequently between the age of thirty-five and sixty-five. The tumour is always softer than in the common, or acinous, variety. When seated near the skin it assumes a dark-red or even purple tint, and has even been mistaken for a melanoma. The nipple is not retracted, but may be inverted. This is, however, a sign of no value. In a very large proportion of cases there is an abundant discharge of blood-stained fluid from the nipple. The tumour grows very slowly, rarely implicates the lymph glands, and exhibits very little tendency to recur or to become disseminated. It is the least malignant variety of mammary cancer.

Literature.—The best reported cases of duct cancer will be found in the Trans. Path. Soc., vols. xxxvii., xxxviii., xxxix., xl., and xli. *See also* Bowlby, St. Barth. Hosp. Rep., vol. xxiv., 263.

Treatment.—The removal of a **fibro-adenoma** of the mamma is such a simple proceeding and so devoid of risk that it is the mode of treatment almost exclusively employed

against these tumours. Even large **cystic adenomata** (adenoceles) weighing eight or ten pounds may be removed with marvellously little risk to the patients, and recovery is invariably rapid and complete.

The treatment which, with our present knowledge, offers the best prospect to individuals affected with **mammary cancer** is *early and complete removal of the whole of the diseased gland and pectoral fascia.*

Careful observations show clearly enough that those patients do best who have the cancerous mammae extirpated at the earliest possible date after the tumour is perceived. There is a consensus of opinion among surgeons who have had the largest experience in cancer that, when a patient comes under observation with a nodule in the mamma which it is reasonable to regard as cancerous, it is the duty of the medical attendant to advise the removal of the breast. It is, however, a remarkable fact that mammary tumours, innocent and malignant, have been subject to observation for centuries, yet there is no organ in the body in which tumours give rise to more doubt or difficulty in diagnosis than in the mamma. This is so generally recognised that it is the duty of every surgeon, before amputating a breast, to make an incision into the swelling in order to assure himself that he is really dealing with a malignant tumour and not a simple cyst, abscess, or localised inflammation. The chief difficulty the surgeon finds in recommending appropriate treatment for cancer of the breast, arises from the circumstance that patients so often conceal the fact that they have a tumour until compelled to seek advice on account of pain, discomfort, or actual misery induced by the ulceration and sloughing of the cancer. There is, of course, a small proportion of females who absolutely refuse to submit to operation in the early hopeful stages, and wait until the skin becomes involved before they realise their unfortunate condition. When the tumour has been allowed to run its course and infect the axillary lymph glands or ulcerate, the chance of doing good by operation is seriously diminished.

The prospects of a patient with cancer of the breast, when submitted to operation may be indicated in the following manner :—

1. The cancer is limited to the breast, does not implicate the skin or pectoral muscle, and has not induced appreciable enlargement of the axillary lymph glands.

Such a case gives good results, immediate and remote. The risks of the operation are very small (one per cent.), and as there is no interference with the axilla, the patient retains free use of the arm. Recurrence and dissemination may be indefinitely delayed.

2. The cancer implicates the skin, but has not yet ulcerated: moderate enlargement of lymph glands.

Immediate extirpation of the breast, cutting wide of the implicated area of skin, dissecting away the pectoral fascia, and removal of the axillary lymph glands is the proper course. Many of these patients enjoy a long immunity from recurrence, but their expectancy of life is less than in the preceding class. The immediate risk to life is much greater in consequence of the interference with the armpit.

3. The cancer has ulcerated, but the extent of skin implicated is small; there is no adhesion of the tumour to the chest wall. The axillary lymph glands are enlarged.

In such a case many surgeons excise the breast and remove the axillary lymph glands, not with much hope of prolonging life, but in order to rid the patient of what will become foul, offensive, and a source of mental anguish.

Although it is extremely difficult to indicate even approximate rules as to the advisability or otherwise, of operating in certain conditions of mammary cancer, there are cases in which it can be definitely laid down that operations are useless. For instance:—

1. When the supraclavicular lymph glands are infected, whether the cancer has ulcerated or not; such extensive infection of lymph glands indicates a high degree of malignancy.
2. When a large area of skin is implicated, and particularly in cases where it is brawny or beset with small nodules. (Cuirass cancer.)
3. In the withering or atrophic form of cancer.
4. In no case where there is reason to believe that dissemination has occurred.
5. When both breasts are implicated.

Of all the circumstances that modify the mortality of operations for removal of the mammary gland, none influence it so much as opening the axilla. This proceeding transforms a simple and safe operation into one often fraught with danger. So important is this that I will emphasise again my opinions in regard to the lymph glands :—

1. The axilla should not be opened unless there is really good reason to believe that its lymph glands are infected.
2. When the lymph glands are obviously enlarged they should be removed with the primary tumour.
3. When the supraclavicular lymph glands are obviously infected, operation is useless.

Not only does the removal of these lymph glands increase the risk of the operation and impair the subsequent utility of the limb, but in operating in the arm-pit the axillary vein has in many instances been torn or punctured. Such extensive proceedings as excision of large portions of the pectoral muscles, and division of the clavicle to facilitate the removal of outrunning portions of the tumours are hopeless enterprises.

Recurrence.—In a certain proportion of cases recurrence of the cancer may be expected. It is important to ascertain on what this depends, as it is usually regarded as an indication that the disease was not removed at the time of operation. The skin incisions may have been made too near the tumour, or fragments of the glandular tissue may have been detached and left behind in the process of reflecting the skin; or outrunners on the deep surface of the breast may have been cut across and small pieces remained hidden in the recesses of the wound. All these have been advanced to explain the recurrence. The reappearance of the disease may take the form of one or more small nodules in, or near, the cicatrix; sometimes actually in a stitch-hole. It may manifest itself as a brawny infiltration of the skin on each side of the cicatrix, and exceptionally recurrence appears as a general outburst of small shotty nodules in the skin over one or both mammary regions.

When the recurrence is localised, especially in the form of one or two nodules, or even as a tumour the size of an egg, it should be promptly removed, so long as there is no sign of dissemination.

CHAPTER XXIV.

CYSTS, ADENOMA AND CARCINOMA OF SEBACEOUS AND MUCOUS GLANDS.

The consideration of tumours connected with sebaceous glands naturally follows upon that of tumours of the mammary gland, because the latter is regarded as being a highly specialised sebaceous gland or group of glands.

It will also be necessary to deal with tumours arising in connection with the cluster of specialised sebaceous glands at the base of the glans penis known as Tyson's glands, for they are the source of a rare species of penile cancer.

Tumours connected with sebaceous glands are : — 1, Sebaceous cysts or wens ; 2, sebaceous adenomata ; 3, cancer of Tyson's glands.

1. **Sebaceous Cysts** (Wens).—The sebum resulting from the activity of a sebaceous gland escapes as it is formed on to the free surface. Should the orifice of the follicle become occluded, the secretion is retained, and the glandular acini, becoming distended, give rise to an appreciable swelling known as a sebaceous cyst. This is the usual description of the mode by which these cysts arise ; but even a superficial examination of a number of sebaceous cysts will serve to show that in many there is no obvious obstruction—indeed, the duct may be widely open and the sebum exuding, so that obstruction of the duct is not an explanation that will cover all cases.

It has long been known that the sebaceous follicles often contain one or more examples of the *demodex folliculorum*. It is usually stated that these arachnids are harmless ; but judging from the grave lesions one species of demodex produces in the external auditory meatus of the dog, it is quite open to question if their presence is merely an epiphenomenon.

These cysts occur in all situations where sebaceous glands abound ; an exceptionally common place is the scalp. The cyst may be single ; sometimes many are present—indeed sixteen or more may be counted on one scalp. In size they vary greatly ; many are as large as walnuts ; others are of the size of peas ; they are rarely bigger than Tangerine oranges.

In most situations sebaceous cysts are readily recognised, as they are distinctly circumscribed and adhere to the skin. On the surface of sebaceous cysts occurring in any part of the trunk and head, save the scalp, close scrutiny will reveal either a black dot or a small dimple. This is the orifice of the follicle, and on picking off the black spot and squeezing the cyst, sebum will exude, and thus furnish positive evidence of the nature of the cyst. It is a curious fact that in wens of the

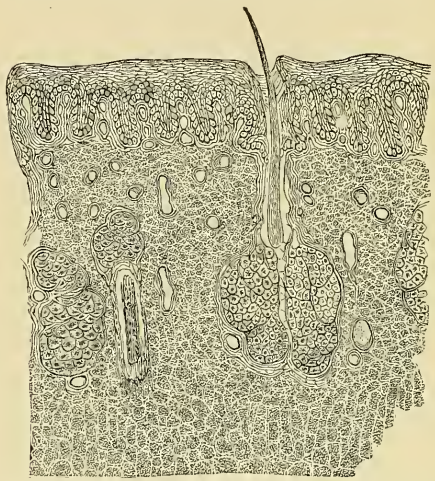

Fig. 109.—Sebaceous glands in the velvet of the antler of a stag (*cervus elaphus*).

scalp the orifice is rarely seen, except those which occur along the junction of the skin of the forehead with the hairy scalp.

A sebaceous cyst, unless it has been inflamed, is easily shelled out of its matrix. It then presents a capsule and contents. The capsule may be exceedingly thin and pliant, the inner surface presenting an epithelial lining; or it may be laminated, thick, and hard. The contents of the cyst may be pultaceous material, consisting of shed epithelial scales, fat and cholesterine: or laminæ of firm yellowish-white material arranged like the tissue of a bulb. These laminæ represent the epithelium of the lining wall that has been shed in successive layers. In rare instances the contents of sebaceous cysts calcify. Sebaceous cysts are sometimes mistaken clinically for dermoids, and *vice versâ*.

Sebaceous cysts occur not only in the scalp, but also in the

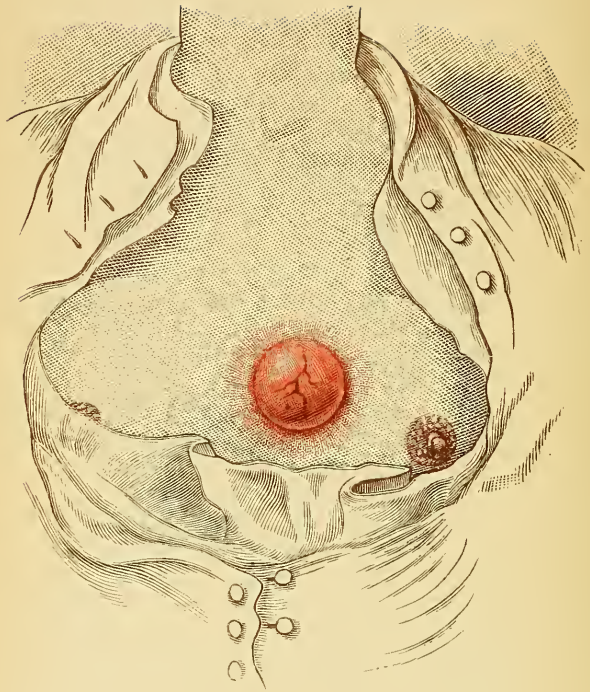

PLATE VI.—Inflamed Sebaceous Cyst, situated on the Inner Margin of the Left Mamma.

skin covering any part of the trunk. They are excessively rare on the limbs. These cysts are not uncommon in the skin of the penis and scrotum, as well as in that of the labia majora and minora. Among other curious situations may be mentioned the interior of ovarian dermoids and in the "velvet" covering the growing antlers of deer.

The "velvet" of a growing antler is covered with fine downy hair furnished with large sebaceous glands. (Fig. 109.)

Sebaceous cysts, apart from the inconvenience their presence often causes, and their unsightliness when growing in exposed situations become sources of discomfort when their contents decompose, or the cyst inflames. Apart from this, they are liable to secondary changes, whereby they form peculiarly foul and fungating ulcers, and in others develop horns. Each of these changes will be considered.

Decomposition of the Contents.—It has already been mentioned that the contents of a sebaceous cyst sometimes ooze from the orifice of the follicle. In some instances such cysts give rise to an extremely offensive odour. This is due to decomposition of the cyst-contents in consequence of admission of air, and as the substance within the cyst contains a large proportion of fat and epithelium, the odour evolved is not difficult of explanation. Decomposition of the cyst-contents occurs independently of inflammation of the cyst, and is almost confined to sebaceous cysts occurring on the trunk.

Inflammation of the Cyst.—When sebaceous cysts grow in situations where they are exposed to injury, as, for instance, on the side of the head, where they may be injured by the hat, or on parts of the body where they are liable to be rubbed by the clothes, they are apt to inflame and suppurate. An inflamed sebaceous cyst has a characteristic colour, and resembles the deep red of a ripe plum. (Plate VI.) Such inflammation may subside and recur. These recurrent attacks of inflammation cause firm adhesion between the capsule and surrounding structures, which renders their removal somewhat tedious. When they suppurate the cyst thins, and at last bursts, unless this result is anticipated by the timely use of a scalpel. The suppuration often leads to their cure; but fragments of capsule may be retained and lead to the formation of fistulæ. In some instances the cyst bursts, the pus escapes,

and the point of rupture heals, the cyst-wall being retained. When this is the case the cyst refills with sebaceous matter. Thus in dealing with these cysts surgically it is an important thing to remove thoroughly every particle of the cyst-wall.

Horns.—Mention has already been made of the fact that sebaceous cysts are occasionally the source of horns, sometimes of very large size. In their general appearance and structure they are indistinguishable from wart-horns. (*See* chap. xx.)

2. **Sebaceous Adenomata.**—It has been so customary to

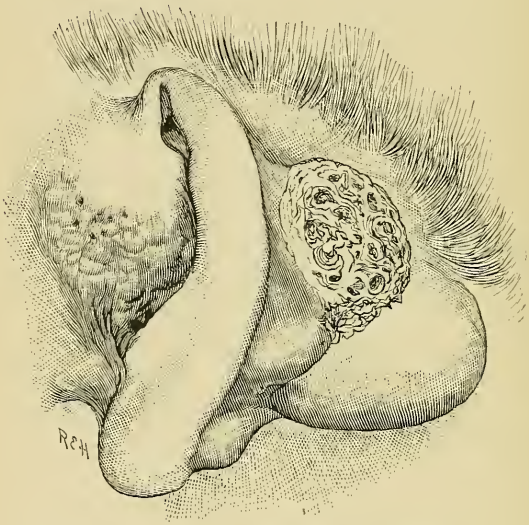

Fig. 110.—Large sebaceous adenoma involving the pinna.

regard all tumours arising in connection with sebaceous glands as wens or sebaceous cysts, that it is quite an exceptional event for them to be submitted to microscopical examination. It has already been pointed out that there are two varieties of sebaceous cysts, one in which the cyst contains sebum and epithelial débris, and another in which the contents are arranged in thick laminæ. In addition to these, tumours occasionally occur in the skin and furnish the usual clinical signs of wens;* when removed and examined microscopically they are found to be composed of lobules which structurally

* Shattock, Trans. Path. Soc., vol. xxxiii. 290.

resemble the exuberant masses upon the nose that used to be called lipomata, but are now known to be due to that overgrowth of the large sebaceous glands that occupy the skin in this situation. These tumours are sebaceous adenomata, and they are liable to ulcerate and exceptionally to calcify.* The largest sebaceous adenoma that has occurred in my own practice began in the skin over the mastoid process and involved the pinna. (Fig. 110.)†

There can be little doubt that a few of the supposed wens on the scalp are adenomata, especially those which fungate. These supposed fungating wens should be carefully studied: they are particularly apt to be mistaken for epitheliomata. Such tumours consist of more or less circular masses of red vascular tissue with definite edges, raised a centimetre or more above the level of the surrounding skin, and strikingly resemble ulcerating epitheliomata — a resemblance that is rendered more complete when the adjacent lymph glands are enlarged. The discharge from such tumours is always very fœtid.

There is usually no difficulty in recognising the nature of these masses when they occur on the scalp, as they are not infrequently associated with wens. (*Frontispiece.*) These appearances are usually described as the result of inflammation and subsequent rupture of a sebaceous cyst. This is probably the correct explanation in some cases, but in others the tumour is made up of adenomatous tissue, which makes it certain that, in a few instances at least, the supposed fungating cyst is an ulcerating sebaceous adenoma.

3. **Carcinoma.**—The common variety of sebaceous glands is not the source of any species of cancer. There is, however, a rare species of cancer constructed on the type of the specialised sebaceous glands named after Tyson. I once had an opportunity of studying such a tumour in a man fifty years of age: it sprang from the penis and was confined to the corona glandis and adjacent parts of the penis. The lymph glands in each groin were infected. I amputated the penis and enucleated the enlarged lymph glands. The patient died nine months later with the signs of secondary deposits in the abdominal viscera, but no dissection was

* Eve, Trans. Path. Soc., vol. xxxiii. 335.
† Trans. Clin. Soc., vol. xxi. 172.

permitted. Sections were prepared from the tumour in such a way as to include the glans penis, its corona, and the tumour; in this way the relation of the cancer to Tyson's glands was clearly demonstrated.

Treatment.—A sebaceous cyst is easily removed: when the skin covering one is incised and the capsule exposed, the cyst usually shells out quite easily. When the cyst has been inflamed and is firmly adherent to the skin, some little dissection will be necessary to effect its removal.

A suppurating cyst can in many instances be dissected out. Often, however, the wall is so thin that the cyst is best treated as an abscess—that is, by free incision.

Before the importance of extreme cleanliness was appreciated by surgeons the removal of sebaceous cysts was often followed by septic inflammation. An excellent notion of the fears which surgeons entertained in regard to secondary complications after the removal of wens is furnished by the case of George IV., who had a sebaceous cyst on the top of his head. This formed the subject of a serious consultation attended by Cline, Astley Cooper, Brodie, and others. Eventually Cooper, with Cline's assistance, removed the wen, and his anxiety lest erysipelas should supervene seems scarcely compensated by the baronetcy which the king bestowed upon him as a reward for the successful issue of the operation.*

Mucous Glands.—These structures, like sebaceous glands, sometimes become transformed into cysts, but they rarely exceed the dimensions of a nut; usually they appear as small transparent bodies the size of small peas. They are fairly frequent in the buccal mucous membrane; they also occur in the mucous membrane lining the trachea and bronchi. (*See* tracheal diverticula).

The mucous glands of the bronchi are of interest in connection with reported cases of supposed primary cancer of the lung. For instance, Dr. Finlay† described the case of a man

* "Life of Sir Astley Cooper," vol. ii., chap. ix. Brodie refers to this case in his "Autobiography," thus:—"Eventually the operation was performed by Sir Astley Cooper in the presence of Sir Everard Home, Mr. Cline, Sir William Knighton, the King's physicians, Sir Henry Halford, Sir Matthew Tierney, and myself; making a very large assembly for so small a matter."

† Med.-Chir. Trans., vol. lx. 313.

thirty-seven years old who died from pulmonary disease. The left lung contained a tumour and the right one numerous secondary nodules; some of the mediastinal lymph glands were enlarged and the liver contained secondary nodules. These tumours exhibited the characteristic histological features of cancer. Coats* reported a case which he investigated in a youth seventeen years old who died from a tumour of the right lung. There were secondary nodules in the left lung, the brain, the femora, some of the ribs, vertebræ, left ilium, and the liver. Many of the secondary knots were small cysts lined with cylindrical epithelium.

Langhans,† who appears to have studied tumours of this kind very carefully, is of opinion that the cancer in such cases originates in the mucous glands of the bronchi.

The Glands of Bartholin and Cowper.—It is well known that Bartholin's glands in the female are very liable to become cystic; they are also very apt to inflame and suppurate. These glands are occasionally the source of carcinoma. Schweizer ‡ has reported a case, and collected the literature.

Cowper's Glands are the homologue in the male of Bartholin's glands in the female. They are liable to inflame, and occasionally become cystic. There is reason to believe that the gland may become cancerous. The most recent contribution to this subject is that by Witsenhausen.‖

Treatment.—Inflamed Bartholin glands are sources of much inconvenience and often distress, which mere incision only serves to aggravate. The appropriate treatment consists in dissecting out every trace of the gland.

* Trans. Path. Soc., vol. xxxix. 326.
† Virchow's "Archiv," vol. liii. 470.
‡ Arch. für Gyn. bd. xliv. 322.
‖ Bruns, *Beiträge*, bd. vii. 582.

CHAPTER XXV.

ADENOMA AND CARCINOMA OF THE THYROID, PROSTATE, PAROTID AND PANCREAS.

THE THYROID GLAND.

Adenomata.—Two varieties of adenoma are met with in the thyroid gland; by most writers they are described as adenomatous goitre and cystic goitre or bronchocele, to distinguish them from the general enlargement of the entire gland known as "parenchymatous" goitre. A thyroid adenoma is an encapsuled tumour of the thyroid gland containing vesicles of the same character as those which make up the normal gland. The size of these adenomata varies greatly; many are no larger than cherries, whilst others are bigger than fowls' eggs. When both lobes contain an adenoma the gland will maintain its normal shape; when one lobe only is involved, the gland becomes unsymmetrical; exceptionally an adenoma will develop in the isthmus. As these tumours increase in size the vesicles coalesce, then the septa gradually disappear, and a thyroid cyst or bronchocele is formed. Bronchoceles sometimes attain very large dimensions. (Fig. 111.) Their capsules are formed of dense fibrous tissue, which may contain calcareous plates; in some old specimens the capsules are converted into calcareous shells. Small bronchoceles contain a thick peripheral stratum of glandular tissue; their central cavities contain colloid material or a thinner fluid of a reddish colour, due to hæmorrhage; not infrequently the fluid is largely charged with cholesterine. In very large bronchoceles all traces of gland tissue disappear; nothing remains but a tough, more or less calcified cyst-wall.

Aug. Reverdin* recorded a case in which an old man of sixty-two years had a cystic adenoma of the thyroid 60 cm. in circumference. On puncturing it a large number of bodies, white in colour and crenate like mulberries, escaped with a large quantity of brown fluid. Reverdin stated that the composition of these bodies was like coagulated fibrin.

* *Journal de la Suisse Romande* 1883.

It is important to bear in mind that adenomata of the thyroid gland, large or small, shell out quite easily. For example, the exceedingly large bronchocele depicted in Fig. 112 was successfully enucleated by P. Bruns.* The patient was fifty-eight years old, and the cyst was so large as nearly to reach the navel. The weight of the tumour produced lordosis in the cervical, and kyphosis in the thoracic regions of the spine. The tumour measured in its horizontal circumference 61 cm., and

Fig. 111.—Large unilateral bronchocele. (*After Berry.*)

in a sagittal direction 70 cm. It was single-chambered, and the walls were in parts calcified. The tumour was so heavy that the woman was in the habit of resting it upon the table when she sat down.

Adenomata and bronchoceles occasionally arise in accessory thyroids. Although it would be appropriate to consider them here, it has been found more convenient to discuss them in relation with dermoids in chapter xxxiii.

Carcinomata.—Cancer of the thyroid gland is an extremely rare affection in England. In the majority of cases it

* Bruns, *Beiträge*, bd. vii. 650.

produces uniform enlargement of the organ; the gland, however, does not attain large dimensions. The cancerous portion disintegrates, and a cavity with shreddy walls, containing dirty semi-fluid material, is usually found in one or other of the lobes. The walls of the cavity may be calcified. The solid parts of

Fig. 112.—Bronchocele of unusual size. (*P. Bruns.*)

the cancerous gland exhibit under the microscope alveoli filled with epithelial cells. In many of the specimens the whole of the normal tissue of the gland is replaced by new growth. Cancer of the thyroid gland usually occurs between the ages of forty and sixty.

The adjacent lymph glands are early involved. Death frequently happens from early implication of the inferior laryngeal nerves, which leads to spasmodic attacks of dyspnœa.

Dissemination in the ordinary form of cancer of the thyroid

gland is very rare, but there is a form of pulsatile tumour of bone associated with, if not secondary to, enlargement of this gland.

Several remarkable cases have been investigated clinically and pathologically in which pulsatile tumours have appeared in the bones of the skull vault, at the sternal end of the clavicle, in the femur, atlas, axis, and other vertebræ. These

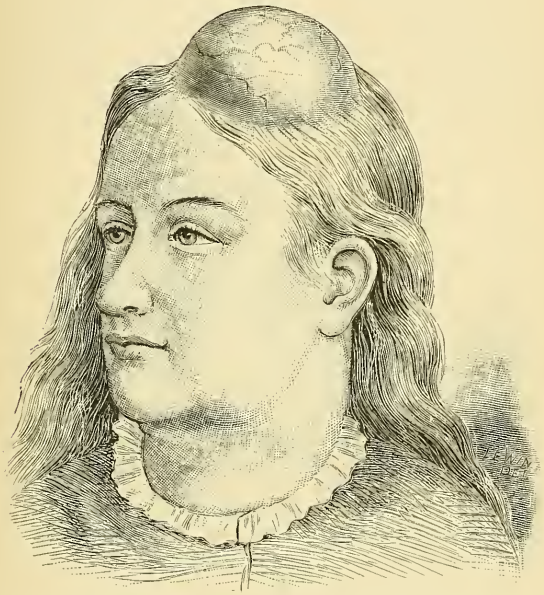

Fig. 113.—Pulsating tumour of the skull, associated with an enlarged thyroid. (*From a photograph in the Museum of the Middlesex Hospital.*)

tumours, when examined histologically, present a structure identical with that of the thyroid gland (Fig. 113); but the fact which invests them with so much interest is that they have in all instances been associated with an obvious enlargement of this gland.

These tumours are excessively rare, and attention in England was first attracted to them by an interesting case recorded by Mr. Henry Morris in 1880. The excellent account of this case is rendered more valuable by the reports of several distinguished pathological histologists to whom portions

of the growths were submitted for microscopical examination. (Fig. 114.)

In this case the patient, a woman forty-four years of age, died with a large pulsating tumour of the left parietal bone; there was also a tumour at the sternal end of the right clavicle and one in the upper end of each femur. She had, as was shown in her photograph, an enlarged thyroid gland. The duration of the case from the time the tumour was first noticed on the skull until the patient died was about six years.

In the reports added to the description of this case attention is drawn to an example described by Cohnheim, in which tumours with a structure similar to the thyroid gland were

Fig. 114.—Microscopical appearance of the tumour of the skull in preceding figure. (*After H. Morris.**)

found in the femur and vertebræ. A case is recorded by Runge where tumours of the atlas and axis presented a similar structure. In each instance the thyroid of the patient was enlarged.

In 1887 Dr. Coats,† of Glasgow, published a detailed account of another case, in which several pulsatile tumours appeared in the bones of the skull vault which structurally resembled the thyroid gland. In this instance the patient, a woman of forty-six years, had marked enlargement of the left lobe of the thyroid gland; this part of the gland was calcified. Satisfactory sections were obtained for the microscope, and the structure of the enlarged part of the gland was found identical with that of the tumours on the skull.

* Trans. Path. Soc., vol. xxxi. 259.

† Trans. Path. Soc., vol. xxxviii. 399; *see also* Haward, Trans. Path. Soc., vol. xxxiii. 291; and Cohnheim, Virchow's "Archiv," bd. lxviii. 547.

Treatment.—Adenomata of the thyroid gland and bronchoceles, when of small size, rarely cause trouble, and an unilateral bronchocele the size of a closed fist, though it appears unsightly, is often quite harmless. Large bronchoceles sometimes cause pain, and when they press upon the trachea give rise to dyspnœa, which will in some cases become so alarming as actually to endanger life. There is a very rare variety known as **wandering goitre** on account of its mobility. So long as the tumour restricts its excursions to the neck no harm results, but occasionally these tumours will descend as low as the thoracic inlet. When this happens, the bronchocele becomes squeezed between the manubrium of the sternum and the trachea. This impaction induces urgent symptoms of dyspnœa.

When, from unsightliness or other causes, it is deemed necessary to interfere with an adenoma of the thyroid or a bronchocele, it is safe practice to enucleate them. The affected lobe is exposed through a median incision, and the thyroid tissue incised until the capsule of the tumour is exposed. By means of a raspatory the adenoma can be shelled out of its bed quite easily. This method of treatment is safer and quite as efficient as thyroidectomy, and the patient runs no risk of hæmorrhage, tetany, or myxœdema.

The treatment of **cancer** of the thyroid gland by operation is very unsatisfactory. The procedure is one of great difficulty; it has a high rate of mortality, and in cases that have survived the operation early recurrence has been the rule.

The Pituitary Body.—In its structure and pathological tendencies this body resembles very closely the thyroid gland. It is also liable to a form of enlargement which is so like a parenchymatous goitre that it might not inaptly be called a pituitary goitre.

As far as I can ascertain, no one has demonstrated that carcinoma occurs in the pituitary body. For a summary of our knowledge regarding its innocent tumours the student should refer to page 316.

THE PROSTATE.

After the age of fifty years the prostate is liable to become greatly enlarged; this increase in size may depend upon

aberrant growth of its muscular tissue leading to the formation of myomata, or upon changes in the epithelial elements giving rise to adenoma or cancer.

Adenoma.—It is by no means rare for the glands in the prostate to enlarge late in life, so that the organ becomes increased to twice or thrice its natural size; but there is a variation in the disposition of the glandular elements of the prostate that not infrequently renders the change peculiarly

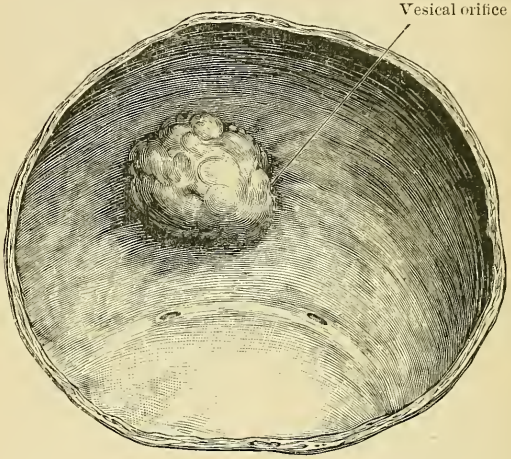

Fig. 115.—Median prostatic adenoma, sketched from within the bladder. (*From a man sixty years of age.*)

disastrous. Commonly the glands in the prostate are arranged in each lateral half of the organ in such a way that their ducts open into the urethral channel in the recess, or prostatic sinus, on each side of the verumontanum. In a small proportion of cases a collection of glands is situated posteriorly to the verumontanum, and in such a way as to serve as an isthmus uniting the glands in the lateral lobes of the prostate. This arrangement of glands has been particularly studied by J. Griffiths.* When a prostate in which this third group of glands exists becomes adenomatous, the median group also enlarges, and in many cases projects into the channel of the urethra, and narrows its vesical orifice. (Fig. 115.) In a typical case, an adenoma of this kind consists of a narrow portion

* *Journal of Anat. and Phys.*, vol. xxiii., p. 374.

occupying the prostatic urethra, and a prominent part protruding into the bladder, so that its relation to the urethra resembles that of a cork in the neck of a champagne-bottle. These median prostatic adenomata are covered by mucous membrane dotted with minute holes, which represent the orifices of glands embedded in the tumour. Small and thoroughly innocent in so far as structure is concerned, this variety of prostatic adenoma often acts so efficiently as a plug to the urethra as to cause complete retention of urine, with all its evil consequences.

Bryant* has described two cases in which, during the performance of lateral lithotomy, a median prostatic adenoma was accidentally included in the shanks of the forceps, in the act of grasping the stone, and torn off as the instrument was withdrawn. He refers to a similar case in Fergusson's practice. Reginald Harrison has also published an instructive paper on this subject.†

Carcinoma.—The prostate is rarely affected by cancer, and this is almost entirely confined to old men. As the disease advances it extends beyond the prostate and infiltrates the tissues around the base of the bladder. The pelvic lymph glands become infected, and frequently dissemination occurs.

Silcock‡ has given a careful account of a case of prostatic cancer in which generalisation occurred. The patient was sixty-one years old. Recklinghausen§ has published five valuable cases of prostatic cancer; the men were between seventy-two and seventy-seven years of age. It would appear that secondary deposit in bone is a very constant feature of prostatic cancer. This is interesting in relation with the peculiar deposits in the osseous system associated with some enlarged thyroid glands, as discussed in the preceding section.

Treatment.—With regard to prostatic adenomata, the difficulty lies in determining their existence; when men over fifty-four years of age suffer retention of urine from prostatic enlargement a pedunculated adenoma, as in Fig. 115, may be suspected. In some instances the surgeon has been confident

* Trans. Path. Soc., vol. xxix., p. 164.
† Med.-Chir. Trans., vol. lxv., p. 39.
‡ Trans. Path. Soc., vol. xxxv., p. 244.
§ *Festschrift* to Virchow, on his 71st birthday, 1891.

of his diagnosis and has removed it through a suprapubic opening in the bladder.* Radical treatment of prostatic cancer is beyond surgical art.

THE PAROTID GLAND AND PANCREAS.

It is so common in clinical work to speak of parotid tumours, that very few efforts have been made to discriminate between the various species of tumours which arise in this gland. In the section of this book devoted to sarcomata, attention is directed to the peculiar composite character of parotid sarcomata and their relative frequency. A careful study of reported cases, as well as observations I have made on patients under my care, has served to convince me that adenoma and cancer attack this gland.

Parotid Adenomata occur as distinctly encapsuled tumours in patients between fifteen and thirty years of age; they are painless, arise in any part of the gland, and rarely exceed a walnut in size. On section there are usually cavities, hence such tumours are often described as cysts of the parotid gland. The walls of the cavities are beset with wart-like masses which on microscopical examination exhibit the same structure as the secreting tissue of the gland. In their general characters these tumours strongly resemble the adenomata so commonly found embedded in the thyroid gland, and are shelled out of the parotid quite easily.

Carcinoma of the Parotid.—Little positive evidence is forthcoming in regard to cancer of this gland. Certain it is that those parotid tumours which appear in patients after middle life, and, growing rapidly, infiltrate the overlying skin and ulcerate, conform to the structural characters of cancer. I am at the present time unable to do more than direct attention to the chaotic condition of our knowledge regarding cancer of the parotid gland.

Carcinoma of the Pancreas.—There is no doubt whatever that the pancreas is occasionally the seat of primary cancer. Judging from the few examples of pancreatic cancer that have fallen into the hands of competent pathological

* McGill, Trans. Clin. Soc., vol. xxi. p. 52.

histologists, the structure of the tumour is a caricature of the glandular acini of the pancreas, although it seems to be the fashion to speak of it as "scirrhus of the pancreas." Exceptionally this cancer becomes disseminated.*

The chief interest of cancer of the pancreas lies in the fact that it is particularly liable to attack the head of the gland and give rise to obstructive jaundice, as it early implicates the common bile duct.

An adenoma of the pancreas has yet to be described.

* Percy Kidd, Trans. Path. Soc., vol. xxxiv., p. 136; Norman Moore, St. Barth. Hosp. Rep., vol. xvii., p. 205.

CHAPTER XXVI.

ADENOMA AND CARCINOMA OF THE LIVER, KIDNEY, OVARY AND TESTICLE.

THE LIVER.

The histological characters of the liver render it possible for epithelial tumours, whether adenoma or carcinoma, to imitate the tubular arrangement of the bile ducts or the disposition of cells characteristic of a hepatic lobule.

Adenomata.—Fully developed adenomata of the liver are encapsuled tumours of a spherical shape: they may be

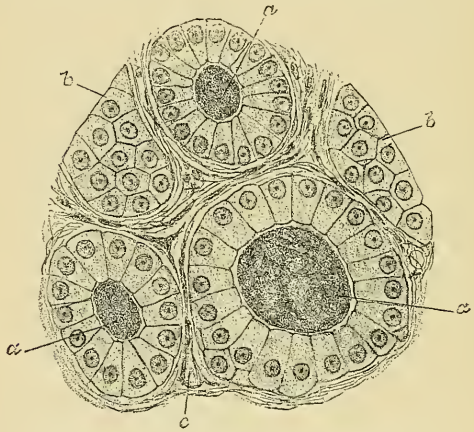

Fig. 116.—Adenoma of the liver. (*After Paul.**)
a, section of blind duct filled with green fluid; *b*, liver cells; *c*, connective tissue.

situated in any part of the liver. Hepatic adenomata vary greatly in size; a solitary adenoma may be no larger than a marble; when multiple they will be as big as Tangerine oranges. In colour some are bright green, others are dull white. The peripheral parts of the tumour consist of solid columns of cells, but on approaching the centre gradually acquire a lumen. These blind ducts are lined with a single layer of columnar epithelium, and contain an inspissated green-coloured material. As the ducts make up the bulk of the tumour it is clear that the olive-green colour of the tumour is due to imprisoned bile. In adenomata of this kind

* Trans. Path. Soc., vol. xxxvi. 238.

the columnar cells are so striking that some observers have described these tumours as columnar epithelial carcinomata of the liver. (Fig. 116.) In other specimens the cells, instead of being arranged in this tubular fashion, are grouped around a minute central lumen two or more deep.

So far as our knowledge at present extends, it would appear that hepatic adenomata as described above are of little clinical importance, and they have been found during the performance of a post-mortem examination when the liver has been sliced up in the course of the inspection. W. W. Keen,* however, has successfully removed a hepatic adenoma, measuring 9 by 6 cm., from a woman thirty-one years of age. The circumstance that such tumours can be dealt with surgically will lead, in all probability, to an extension of knowledge concerning them.

Carcinomata.—Hepatic cancer varies greatly in its external appearance: sometimes it assumes the form of compact nodules of a white colour projecting from the surface of the liver and visible on every cut surface, the nodules varying in size from a marble, or ripe cherry, to tumours as large as, and even exceeding the fist. Many of the surface nodules present a central depression or umbilicus.

In other cases the cancer assumes the form of an irregular infiltration of soft growth of an olive-green colour; some of the tracts will assume a yellow colour. In all cases the liver is enlarged, sometimes to two and even three times its natural size. The surface is in most cases irregularly lobulated.

Dissemination of the cancer is the exception; secondary nodules have been found in the lung, and enlarged lymph glands in the portal fissure: in one of the cases secondary nodules occurred in the lung, and the mediastinal lymph glands were enlarged and infiltrated with cancer.

In point of structure hepatic cancer conforms to two types, the **tubular** and the **acinous**, but the imitation in the case of cancer is not so good as with hepatic adenoma.

Rindfleisch in reference to the tubular species of adenoma writes:—"The peculiar intention which is expressed in the whole foundation advances to a delusive imitation of a tubular

* *Boston Med. and Surgical Journal*, April 28, 1892.

gland." The difference between the tubular adenoma and the tubular carcinoma is that the imitation is still more delusive, and this is equally true of that which is called the acinous species.

Clinical Features.—Hepatic cancer occurs equally in men and women, and is most frequent between the fortieth and sixtieth years. An example has been reported in a boy of fourteen years.

Cancer of the liver leads to enlargement of this gland and jaundice, which may be slight and transient or of great intensity; in a few it has only been observed towards the termination of life. Ascites occurs in most cases.

Cancer of the Gall Bladder is provisionally described among the epitheliomata (page 215).

THE KIDNEY.

It is clear that if the view be correct that adenoma and cancer caricature the structure of the glands in which they occur, such tumours arising in the kidney should be imitations of the uriniferous tubules. As far as my observations have extended, the only tumour of the kidney to which the term renal adenoma is applicable is that peculiar condition known as **congenital cystic kidney**. It is by no means a rare affection. Nearly all the museums attached to the London hospitals possess several specimens, and their appearance is so characteristic that the condition is not likely to be overlooked. Usually both kidneys are affected, but however much they may be enlarged, the natural shape is retained. The kidneys in typical examples of this disease are converted into cystic masses, so that they exhibit a sponge-like appearance on section. The cysts vary greatly in size: some are as small as rape-seed, others as large as cherries; they rarely exceed these dimensions. Some of the cysts project from the surface of the kidney, but though interfering with the smoothness of the gland, they do not distort it. The cortical and medullary portions of such kidneys are indistinguishably blended, but here and there tracts of cortical tissue may be detected among the cysts. (Fig. 117.)

In the early stages the cyst-walls have a membrana propria, and are lined with tesselated epithelium; which in

advanced specimens is difficult of detection. When the disease is not far advanced the renal pelvis is easily recognised, but in the later stages it becomes filled with fatty tissue. A very striking feature in these cases is the extreme narrowness

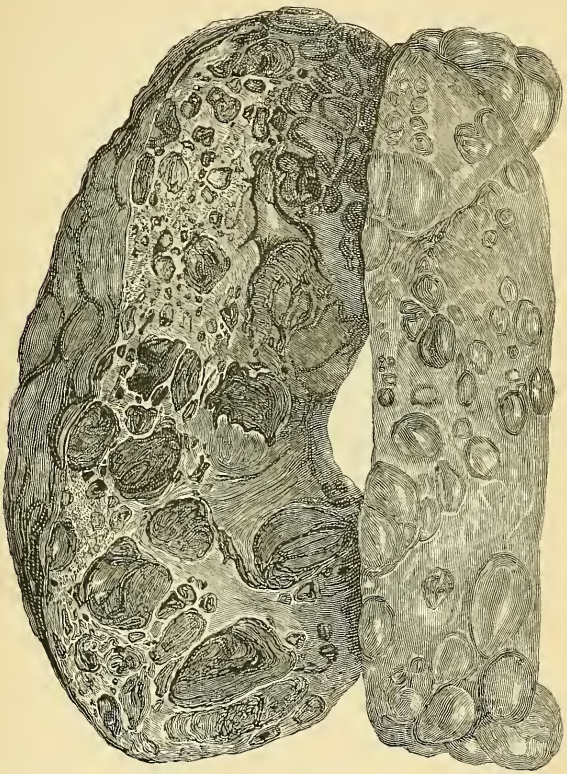

Fig. 117.—Congenital cystic kidney. (*Museum, Middlesex Hospital.*) (*H. Morris.*)

of the ureter, and yet in all the cases that have come under my observation it has been pervious throughout. The vessels supplying such kidneys are always small.

The kidneys when congenitally cystic sometimes attain an enormous size—so large indeed that they seriously impede labour, and often necessitate destruction of the fœtus in order to enable delivery to be effected: in a large proportion of cases in which the fœtus comes away without difficulty it is

still-born and often malformed; such conditions as anencephalia, club-foot, and spina bifida are often found associated with congenital cystic disease of the kidneys. Minor degrees of the affection are not incompatible with life, and several instances are known in which such kidneys have been found in adult individuals.

Virchow seems to have been one of the first to study this

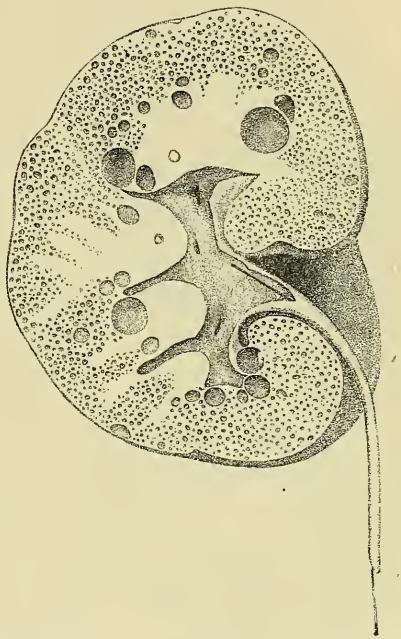

Fig. 118.—Congenital cystic kidney; early stage. (*Shattock.*)

condition particularly, and he regarded the cysts as dilatations of the uriniferous tubules in consequence of the absence of a renal pelvis. This explanation is not good, for as has already been mentioned, the pelvis may be demonstrated in early specimens. (Fig. 118.) I have dissected twenty examples without succeeding in finding any evidence of obstruction in the urinary tract. The only example which gives the least colour to the suggestion that these cysts are due to hindrance to the escape of urine is one described by Shattock,* in which

* Trans. Path. Soc. vol. xxxix. 185.

an embryo of the fourth month with an imperforate urethra, had an enormously distended bladder and congenitally cystic kidneys, but the ureters were not dilated.

It is pointed out in chapter xlii. that in the fœtus, obstruction to the flow of urine leads to hydronephrotic changes similar to those which occur in the adult. Careful consideration of the evidence shows that the cysts, in

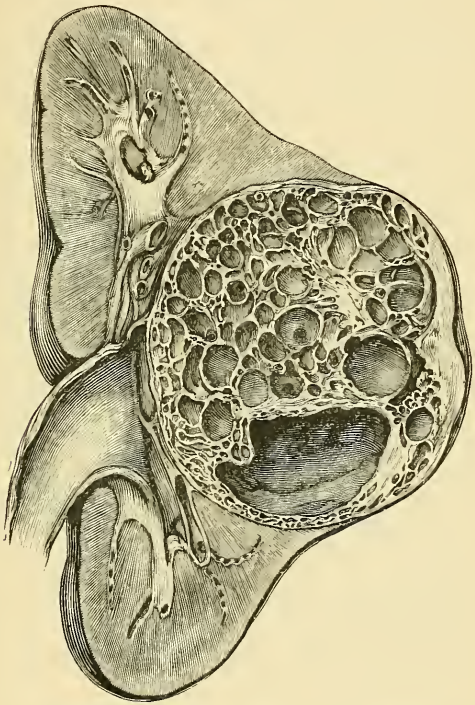

Fig. 119.—Adenoma of the kidney. (*W. Edmunds.*)

congenital cystic disease of the kidney, are not the result of obstruction.

Shattock* has advanced the opinion based on careful histological researches that in these kidneys we have to deal with a combination of mesonephros (Wolffian body) with the metanephros (true kidney), and the cysts may be regarded

* Trans. Path. Soc., vol. xxxvii. 287.

as arising in remnants (or rests) of the mesonephros embedded in the true kidney. My own inquiries lead me to regard this view as probable; it is certainly more satisfactory than the retention view advanced by Virchow.*

Dr. W. Edmunds† has described a specimen which is interesting in relation to the opinion that the phrase "congenital cystic kidney" might with great convenience be replaced by the term "renal adenoma." In a kidney removed from a girl eighteen years old, an encapsuled tumour was found projecting into one of the calyces (Fig. 119). It had a diameter of 6 cm. and consisted of a congeries of cysts lined with cubical epithelium, and in every way comparable to those represented in Fig. 117.

Carcinoma.—In considering renal cancer we are involved in as much difficulty as with renal adenoma. It has been so much the fashion with surgeons to describe malignant tumours of the kidney under the meaningless title of "encephaloid" that we have no histological data to guide us in determining the nature of such tumours. However, I am convinced, from my own investigations, that a large proportion of such tumours are in reality sarcomata, but I am equally certain that in a few "encephaloid" tumours of the kidney, abnormal development of epithelium is a distinguishing feature.

A good example of a renal epithelial tumour has been described by Sharkey.‡ The description is accompanied by a careful drawing of the microscopical features of the tumour; in some parts of it there were alveoli lined with regularly arranged columnar epithelium. "In such parts the tumour presented a rough but striking resemblance to the tubular structure of the kidney."

Judging from some specimens I have examined there can be little doubt that malignant tumours are occasionally met with in the kidney which are essentially epithelial in origin. It is, however, impossible to write an account of carcinoma of the kidney until surgeons are more alive to the interest of the question and take steps to place malignant tumours of the

* Ueber Congenitale Nierenwassersucht, Gesammelte Abhandlungen, p. 839. (*See also* Pye-Smith, Trans. Path. Soc., vol. xxxii. 112.)

† Trans. Path. Soc. vol. xliii. 89.

‡ Trans. Path. Soc., vol. xxxv. 235.

kidney, whilst still fresh, in the hands of experienced pathological histologists.

THE OVARY.

There is no glandular organ of the body which is liable to such an extraordinary variety of tumours as the ovary. The chief features of the innocent epithelial ovarian tumours are epitomised in the section devoted to dermoids. (Chapter xxxvii.) Of these, there is one variety especially described as **ovarian adenoma,** so that it will be unnecessary to devote space to it here except to remark that it is, in point of structure, in no sense an imitation of the true tissue of the ovary.

In regard to primary **cancer** of the ovary very little reliable evidence is forthcoming. Many cases have been described in which the ovary has become transformed into a large tumour which, under the microscope, presented an alveolar disposition of cells; but such specimens have for the most part occurred in children, whereas cancer in every other gland is a disease of adult life. This fact alone should make us pause before deciding simply on the alveolar constitution of a tumour that it is cancer. Nevertheless, malignant tumours are occasionally seen in the ovaries of individuals past middle life, in which epithelium plays a very characteristic part. Such tumours also exhibit the clinical features of cancer, in that they infect the peritoneum and very rapidly destroy life.

It is quite possible that the rarity of such tumours in part explains the absence of accurate knowledge concerning them. It is a subject needing very careful investigation.

THE TESTICLE.

The infrequency of tumours of the testicle stands in striking contrast to the frequency with which they occur in the ovary. Formerly it was the fashion to describe all malignant tumours of the testicle as cancer; of late years it has been ascertained that by far the greater number are sarcomata.

As to whether adenomata and cancers that caricature the secreting structure occur in the testicle, nothing definite is known. So far I have been unable to recognise such a specimen. There is a variety of adenoma that originates in the

paradidymis; it is very similar in structure to a renal adenoma, but it is in no way connected with the secreting tissue of the testicle. (*See* chapter xliv.).

Malignant tumours of the testis require careful investigation, conducted on a full supply of material, accompanied by complete clinical histories.

CHAPTER XXVII.

ADENOMA AND CARCINOMA OF THE STOMACH, INTESTINES, AND RECTUM.

THE STOMACH.

Adenoma.—Very little attention has been devoted to the study of adenoma of the stomach; this is due to the fact that it occurs in the immediate vicinity of the pylorus, and like carcinoma in this situation, blockades the strait by which the stomach and duodenum are connected, and leads to starvation. Hence as the clinical effects are practically identical with those induced by cancer of the pylorus, few efforts have been made to differentiate the varieties of pyloric tumours.

A gastric adenoma is usually ovoid when it involves the pylorus, and sometimes forms a tumour as large as a fowl's egg. When it attains such a size as to drag upon the attachment of the pyloric end of the stomach it may come to occupy a position on a level with, or even below, the umbilicus, and is sometimes so mobile that it may be shifted into all the regions of the abdomen. The structure of an adenoma in the neighbourhood of the pylorus is a repetition of the pyloric glands.

Carcinoma.—This disease is by no means rare in the stomach. The records of most general hospitals in London, capable of accommodating one hundred medical patients, show a yearly average of six cases.

In structure, gastric cancer mimics the tubular glands which are so numerous in the mucous membrane of the stomach.

Concerning the mode in which the affection begins, no precise information is forthcoming; it is commonly situated at, or in, the immediate neighbourhood of the pylorus. "If a line be drawn from one inch (2·5 cm.) to the left of the œsophagus, to a point on the lower border of the stomach four inches (10 cm.) from the pylorus, the part to the left of this line will be found to suffer very rarely from cancer. The rest of the surface, the right and upper part, is the peculiar seat of cancer" (Wilks and Moxon).

In the early stages the disease is limited to the mucous membrane; it then invades the muscular and, in a fair proportion of cases, the serous coats. The infiltration of the tissues about the pylorus leads to its obstruction, which is often so extreme that an ordinary probe can scarcely traverse it. The mucous surface of the tumour ulcerates, sloughs, and bleeds. Occasionally the pyloric branch of the hepatic artery is eroded, and the bleeding may be so profuse as to terminate life in patients whose strength has been reduced by small hæmorrhages, frequently repeated, from the ulcerating surface of the cancer. Whilst these changes are in progress on the mucous aspect of the tumour the subserous tissues become infiltrated, the overlying peritoneum is involved, and adhesions form between it and the omentum, the parietal peritoneum, liver, and occasionally the transverse colon.

The extent to which the disease infiltrates the surrounding parts varies greatly. In a large number of cases it remains restricted to a zone extending 3 cm. on each side of the pylorus; exceptionally it will implicate the duodenum as low as the orifice of the common bile duct. More often the disease creeps along the lesser curvature of the stomach. When the cardiac orifice is attacked, the cancer will extend into the œsophagus and downwards along the lesser curvature.

For a time the disease remains restricted to the walls of the stomach, but later it spreads along the adhesions to such structures as the liver, pancreas, gall bladder, duodenum, colon, spleen, and diaphragm: then, as ulceration follows, it happens that the floor of the ulcer will be formed by the liver, the pancreas, or the spleen. When such parts as the colon or duodenum form the base of the ulcer, perforation occurs, and a gastro-colic or gastro-duodenal fistula is formed. It is a singular fact that these fistulæ are more common with cancerous than with the simple forms of gastric ulcers.

The lymph-glands in the gastro-hepatic omentum are infected in more than half the cases; extensive enlargement of the lumbar glands sometimes happens, and those lying in the posterior mediastinum may be infected; the infection, in exceptional cases, may extend to the glands at the root of the neck.

Dissemination is the rule with cancer of the stomach. The secondary nodules usually make their appearance in the liver

and the lungs. Secondary nodules are frequently found in one or both ovaries.

Finlay* has recorded a case in which a cancer originating at the cardiac orifice of the stomach became widely disseminated, and the skin of the trunk was thickly studded

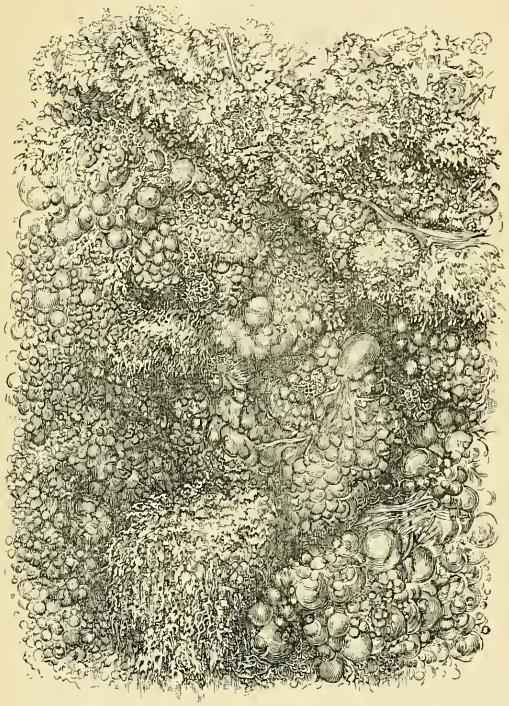

Fig. 120.—So-called colloid of the omentum.

with hard subcutaneous nodules varying in size from a pea to a walnut. There were a few nodules on the arms and legs. The lymph glands in the groins and axillæ were enlarged. During life two nodules were excised, and when examined microscopically were found to consist of alveoli lined with columnar epithelium. This circumstance indicated that the primary growth was in the alimentary canal, although during life its precise locality could not be fixed.

There is a curious and somewhat rare condition of the

* Trans. Path. Soc., vol. xxxiv. 102.

omentum associated with cancer of the stomach. That it is little understood may be inferred from the variety of names applied to it:—colloid or hydatid tumour; colloid cancer; myxo-sarcoma of the omentum. There can be little doubt that the uncertainty of knowledge concerning it is very largely due to its rarity. (Fig. 120.)

In typical cases the omentum is greatly thickened (5 to 10 cm.), and it may weigh upwards of ten pounds. The surface is flocculent, and on close inspection small rounded collections of gelatinous material may be seen in the midst of the villous processes; some of them are stalked and look like white currants. On microscopical examination the bulk of the omentum is made up of myxomatous tissue, but here and there collections of epithelial cells are found surrounded by incomplete capsules of fibrous tissue. The general impression I have formed from an examination of the only specimen that has come under my observation is, that the condition is due to infiltration of the great omentum from a cancerous stomach, and the cancerous material with the proper omental tissue undergoes colloid or myxomatous degeneration. The subject requires the close investigation of perfectly fresh material for its proper elucidation.

Clinical Features.—Cancer of the stomach is rare before the thirtieth year; it is most common between the fortieth and sixtieth years; it has been demonstrated as early as thirteen; it occurred near the cardiac end of the viscus, and the patient was a girl.*

Gastric carcinoma runs a very rapid course, life being rarely prolonged beyond twelve months from the time the disease is first recognised. Its rapidly fatal course, especially when the pylorus is implicated, is largely due to the obstruction offered to the escape of food into the duodenum; hence it is retained in the stomach, which often becomes dilated into a huge sac, sometimes reaching as low as the pubes. Fermentation of the retained and partially digested food occurs, and the contents of the stomach are vomited at irregular intervals, mixed with altered blood which escapes from the ulcerated surface of the tumour.

* Norman Moore, Trans. Path. Soc., vol. xxxvi. 195.

When cancer involves the cardiac orifice, the stomach is usually contracted. Cancer of the stomach causes death in various ways. Of these the chief are :—exhaustion due to starvation and frequent hæmorrhage; perforation into the general peritoneal cavity and fatal peritonitis. In exceptional instances the diaphragm is perforated and fatal pleurisy ensues.

THE INTESTINES AND RECTUM.

Adenoma and carcinoma occur in all parts of the intestine, from the duodenum to the anus, but they occur most frequently in the rectum. This fact, and the circumstance that the rectum is accessible to clinical examination have led surgeons to study rectal tumours with much care. It is useful to illustrate the general features of adenoma and cancer of the intestine from the facts obtained by a study of these tumours as they occur in the rectum, for they all conform to the same histological type.

The prevailing type of gland in the intestine is the Lieberkühnian follicle. Enough evidence has been adduced in the preceding sections to prepare us for the fact that intestinal adenomata would be reproductions of these glands, and that the carcinomata would caricature them. If to these glands we add occasional clusters of adenoid follicles in the cancers, then the mimicry will be complete.

Adenomata of the Rectum.—These tumours occur in the form of polypoid outgrowths of the mucous membrane, especially in young children. In some cases they are no larger than peas; in others rectal polypi may be as big as walnuts. When large an adenoma is, as a rule, solitary; when multiple they are generally small. It is rare for them to be present in great number. The large solitary adenoma is attached to the mucous membrane by a fairly thick stalk; in life the tumour and its pedicle has the same deep red colour as the inner wall of the gut, and is generally closely pitted with minute dots; these are the orifices of the mucous glands.

On section the greater part of the adenoma will be found to consist of vascular connective tissue; over this is spread a layer of mucous membrane beset with large follicles lined

with a single layer of tall columnar epithelium. The follicles are, as a rule, filled with thick mucus. (Fig. 106).

An adenoma occasions local trouble only; when attached within 6 or 8 cm. of the anus—and this is the usual situation in which to find it — the pedicle gradually elongates until it is long enough to allow the adenoma to be carried beyond the sphincter during defæcation; it is then

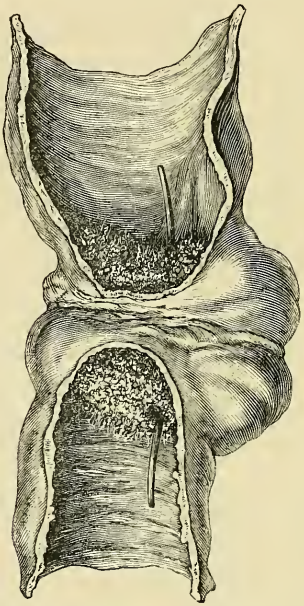

Fig. 121.—Cancer of the sigmoid flexure of the colon.

liable to be caught and strangulated. This is sometimes curative, for the tumour, or "polypus" as it is usually called, sloughs.

Carcinoma of the Rectum.—In its early stages—that is, when it becomes clinically recognisable—cancer of the rectum projects from the mucous membrane as a hard tuberous mass: the surface of the tumour, irritated by the passage of fæces, ulcerates and forms a foul, crater-like ulcer. The cancer tends to spread at its periphery and extend round the bowel: at length it projects as a thick circular diaphragm, and so narrows the gut that the passage becomes contracted until no wider than a crow-quill. (Fig. 121.) In some specimens

the lumen of the bowel is not so much narrowed by the exuberance of the growth as by the contraction it exercises upon the intestinal wall. Sometimes the tumour will have a diameter of 2 cm. and less, yet its power of contraction is so great that it completely obstructs the bowel. This variety is more frequent in the colon than in the rectum. (Fig. 122.)

In some cases the disease, instead of forming a localised

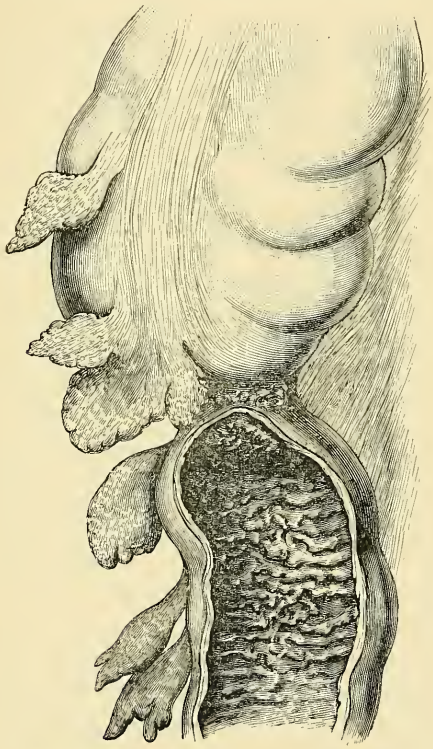

Fig. 122.—Cancer of colon (constricting variety).

tuber, tends from the first to infiltrate the muscular as well as the submucous tissues, and even extends beyond the confines of the gut to adjacent parts such as the peritoneum, pelvic connective tissue, prostate, or vagina. Ulceration occurs early in this variety. Whilst in one case the cancer tends to penetrate the wall of the rectum, in another it will form large and exuberant masses, blocking up the gut and even protruding

beyond the anus. It may in a third case be restricted to a narrow area of the bowel, and remain apparently indolent for a long period.

Rectal carcinoma consists of glandular recesses, lined with tall columnar cells, embedded in a stroma of dense connective tissue. In order to make out the nature of the growth, sections should be taken from the margins of the tumour, because the deeper parts are much altered by ulcerative and necrotic changes. As a matter of fact, in many cases of rectal cancer, judging merely from the appearances under the microscope, it would be difficult to determine whether the section was prepared from an adenoma or a carcinoma; but it must be borne in mind that the adenoma remains restricted to the mucous membrane, whereas in cancer we find the glands with their characteristic columnar cells interspersed among the muscular fasciculi of the gut-wall. The proportion of connective tissue varies greatly. In some cancers the glands are closely set; in others they are ill-formed, arranged irregularly, and embedded in an abundance of connective tissue. Occasionally collections of lymphoid tissue are observed. Harrison Cripps states that when a rectal cancer invades the anus, the part of the tumour which involves the anus loses its glandular character and assumes the form of a squamous-celled epithelioma. For beautiful illustrations of the histology of rectal cancer the student should consult Cripps's papers.* Rectal cancer is very rare before the age of twenty; it is commonly met with between the thirtieth and fifty-fifth years.

The pelvic and lumbar lymph glands are first involved, then those glands lying in the course of the external iliac artery. Should the skin of the anus become infiltrated, then the inguinal lymph glands may be infected. The liver is the eat of secondary deposits in a large proportion of cases of rectal cancer. Occasionally widespread dissemination occurs, and nodules are formed not only in the liver, but in the lungs, kidneys, and bones. Few things are more surprising than on examining a cancer nodule from the liver, or from a long bone like the humerus, to find Lieberkühn's glands, with their tall columnar epithelium.

When rectal cancer invades the peritoneum, this serous

* Trans. Path. Soc., vols. xxxii. 87, and xxxiii. 165.

membrane will sometimes become dotted over with minute elevations like sago grains.

Carcinoma of the Intestine.—Cancer of the small and large intestine is of the same structure, and has the same relation to the gut as that which occurs in the rectum. The liability of the various sections of the intestine to cancer varies greatly. In the duodenum, jejunum, and ileum this disease is very rare; it has on a few occasions been observed at the ileo-cæcal valve, and is not unknown at the orifice of the common bile duct. In the large bowel, excluding the rectum, cancer is fairly frequent, and exhibits a curious tendency to occur at the sigmoid, splenic, and hepatic flexures. The relative frequency with which the various parts of the intestine, from the beginning of the duodenum to the anus, are attacked by cancer may be represented in the following way :—

Of every one hundred cases, seventy-five occur in the rectum; of the remainder, twenty-three would be localised in the large bowel and two in the small intestine, including the ileocæcal valve, and would probably be distributed in the following manner :—

Small intestine and ileo-cæcal valve .	2
Cæcum	2
Hepatic flexure of colon . . .	3
Splenic flexure of colon . . .	4
Sigmoid flexure	10
Intermediate segments of colon . .	4
	25

Of the intermediate segments of the colon the transverse is, perhaps, the most frequent situation for cancer. A search through the home literature indicates that very few records of cancer of the ileo-cæcal valve exist.*

Concerning the mode in which cancer of the small intestine, cæcum, and colon begins nothing is known. The symptoms to which it gives rise are those of intestinal obstruction, and is, in most cases, a matter of conjecture, mainly based upon the age of the patient and the gradual manner in which the signs develop, when the surgeon arrives at the conclusion

* Hawkins, Trans. Path. Soc., vol. xlii., p. 132.

that the trouble is due to cancer in some part of the large intestine. As far as I am aware, the diagnosis of primary cancer of the small intestine has not been made, for when seated in the small gut below the duodenum, cancer usually gives rise to signs of acute obstruction. From this it follows that our knowledge of intestinal cancer is based upon a study of the disease in its advanced stage. One of its most characteristic features is the way it travels round the gut and forms a zone of hard material projecting into its lumen, and then, as it contracts, the diseased parts, as seen from the outside, look as if the intestine had been girt with a tight ligature. In the later stages the lumen of the gut becomes so straitened that nothing but a narrow, tortuous channel traverses the cancerous mass, and this allows the liquid fæces retained in the dilated segment of the gut on the proximal side of the tumour, gradually to trickle through, and at times even this limited channel of escape becomes closed. Occasionally, after many days of complete obstruction, a portion of the cancer sloughs, and the obstruction is temporarily relieved. The enormous quantity of fæces that escapes on such occasions is almost beyond belief.

A large proportion of patients with intestinal cancer succumb from the effects of obstruction: in others death is brought about by other means. For example, the retention of the contents of the bowel leads to dilatation of the gut above the stricture; this may induce ulceration and gangrene, which terminates in perforation. In this event the effect depends on the part of the gut perforated. Should the opening allow fæcal matter to escape into the peritoneal cavity, peritonitis is the consequence, and as a rule, kills the patient in a few hours. In the case of the cæcum, the ascending or descending colon, the extravasation may take place behind the peritoneum and give rise to a fæcal abscess. Such abscesses in connection with the right colon will point in the neighbourhood of Poupart's ligament (usually above, but sometimes below this band), or at the crest of the ileum. I have known pus from an abscess of this kind in connection with the descending colon, travel between the muscular planes of the belly-wall as far as the linea semilunaris, and the intestinal gas caused the whole of the left half of the belly-wall to be emphysematous.

In chronic intestinal obstruction due to cancer of the descending colon, the cæcum becomes greatly distended with fluid fæces; this leads to ulceration of its wall, which occasionally perforates and sets up rapidly fatal peritonitis.

It occasionally happens that a distended coil of bowel immediately above a cancerous stricture will adhere to an adjacent piece of healthy intestine, which will be infiltrated by the cancer; sloughing follows, and a fistula forms between the implicated coils. Such an event rarely improves the patient's condition, as the communication almost always takes place with a piece of intestine on the proximal side of the stricture. It has happened to me on three occasions to meet with cancer in the loop of a U-shaped colon. The convexity of the loop had in two instances come in contact with, and perforated into the bladder. Uterine cancer sometimes perforates into the peritoneal cavity and implicates the colon; hence care is necessary in discriminating between a cancerous colon adherent to the uterus, and a cancerous uterus implicating the colon. Cancer of the sigmoid flexure is, in a large proportion of cases, localised in that portion of the flexure in relation with the brim of the true pelvis, and it is a curious fact that in such cases the left ovary is often adherent to, and occasionally forms the base of a cancerous ulcer in this part of the colon.

Briefly summarised, the modes of death in cancer of the intestines are:—Intestinal obstruction, intussusception, perforation into the peritoneal cavity, and suppurative nephritis when the disease is in the rectum and involves the ureters.

Treatment.—The ideal treatment of cancer of the alimentary canal from the pylorus downwards is excision of the tumour. In the case of the rectum this mode of treatment has been practised very extensively and with a gratifying measure of success.

In the higher region of the intestine—such, for instance, as the colon and the pylorus—it is not only necessary to resect the whole circumference of the gut, but to adopt measures to unite the cut ends of the intestine or stomach, as the case may be, in such a way as to insure the continuity of the lumen of the canal, and this union must be so perfect that no bowel contents or secretions can leak into the

peritoneal cavity. This makes the radical treatment of intestinal cancer a matter of risk and difficulty. In many cases the difficulty is so great that, except in very favourable circumstances, surgeons prefer to adopt simple methods which will relieve the patient, rather than complicated and dangerous proceedings, with the hope of curing the disease.

The palliative measures vary with the situation of the cancer. For example, when it attacks the pylorus, excision of the pylorus and union of the cut edges of the stomach and duodenum is a dangerous and difficult procedure, and applicable to such a small proportion of cases that this practice is now abandoned. In order to obviate the almost inevitable death from starvation, a fistula is sometimes established between the stomach and jejunum. This method of gastro-intestinal anastomosis has in a few cases been followed by very encouraging results, but it does not meet with general favour. A few surgeons not only advocate gastro-intestinal anastomosis, but recommend excision of the cancerous pylorus (pylorectomy) in favourable cases. These methods are still upon their trial.

Cancer of the **rectum** can in many instances be easily and freely excised (proctotomy). A ready way in which surgeons estimate the suitability of a rectal cancer for excision, is to introduce the index finger through the anus, and if the tip of the finger passes beyond the tumour it is taken as an indication that, so far as implication of the rectum is concerned, the disease admits of removal. The favourable cases are those in which the cancer is of such limited extent that it can be circumscribed by the finger, is mainly limited to the posterior wall of the gut, and does not involve the anus, prostate, or vagina, according to the sex. When rectal cancer is too extensive for excision, patients are often rendered comfortable by inguinal or lumbar colotomy. The routine employment of colotomy for every case of rectal cancer that cannot be excised is to be deprecated.

In the case of the **colon** various methods have been advocated. The ideal operation consists in resection of the diseased area of the gut and sutural union of the cut ends so as to restore the continuity of the intestine. This operation

has been successfully accomplished,* but it is very tedious and attended by an excessively high mortality.

It is much safer practice to resect the diseased part of the colon and unite the edges of the bowel to the margins of the skin incision either in the loin or flank, according to the fancy of the operator. This mode, introduced by Mr. Bryant† and known as *colectomy*, is of very limited application, as it depends entirely on the position and freedom of the tumour from adhesions.

The third method is to perform *colotomy*, an extremely simple proceeding when the position of the cancer can be ascertained. In a large majority of cases this is impossible. In such circumstances the most judicious proceeding consists in opening the abdomen in the middle line, between the umbilicus and the pubes, then introducing the hand for the purpose of ascertaining the seat of the cancer. This accomplished, the abdominal wound is closed and an artificial anus established in the right or left loin (or in the flank), according to the requirement of the case.

In all patients that come under my care with intestinal obstruction, supposed to depend upon cancer of the colon, and in whom no tumour can be localised by physical signs, I prefer to explore the intestines through an abdominal incision, and then perform a right or left lumbar colotomy as the case demands.

The study of a large number of cases indicates that life is more often prolonged after colotomy than after resection of the cancerous gut, or colectomy, whilst the risk to life is enormously diminished.

It is also a fact well worth bearing in mind that after the pressure upon a section of colon, straitened by cancer, is relieved by a timely colotomy, the obstruction after a time partially disappears and allows fæces once more to pass into the distal portion of the gut. Indeed in some cases the passage through the cancerous segment becomes so free that patients allow the colotomy opening to close.

* Kendal Franks, Med.-Chir. Trans., vol. lxxii. 211 ; and Treves, *Clin. Journal*, vol. i. 224.

† Med.-Chir. Trans., vol. lxv. 131; Pitts, Trans. Clin. Soc., vol. xx. 210.

CHAPTER XXVIII.

ADENOMA AND CARCINOMA OF THE UTERUS AND FALLOPIAN TUBES.

From an anatomical point of view it will be necessary to consider the subject of epithelial tumours of the uterus and tubes in three sections:—

1. Adenoma and carcinoma of the cervical canal.
2. Adenoma and carcinoma of the body of the uterus.
3. Adenoma and carcinoma of the Fallopian tube.

This arrangement is justified on the grounds that the character of the glands differs in each section. Epithelioma of the vaginal portion of the cervix has been already considered. (Page 212).

THE CERVICAL CANAL.

Adenomata.—The cervical canal is lined with columnar epithelium and furnished with numerous racemose glands. Adenomata, which are structurally repetitions of these glands, are very common at the neck of the uterus. There are three varieties; sessile, pedunculated and racemose adenomata.

A **sessile Adenoma** appears as a soft velvety areola around the os; it is in colour like a ripe strawberry, and thickly dotted with minute spots of a brighter pink. This pink tissue is composed of glandular acini lined with large regular columnar epithelium. The glandular tissue often extends beyond the margins of the os and invades the vaginal portion of the cervix. Sometimes it is so abundant that the apex of the cervix, instead of being a cone, assumes rather the shape of the under surface of a mushroom. The glandular mass is not confined to the margins of the os, but extends for a variable distance up the canal. When adenoma affects a lacerated cervix the whole of the exposed portion of the canal is involved. The surface of a sessile adenoma is covered with tenacious mucus secreted by the abnormal glands.

Pedunculated Adenomata are rarely large; they may grow from any part of the cervical canal, but are most frequently found springing from the lower 2 cm. of the canal. As a rule,

they occur singly, but two or more may be present. They are soft and velvety to the touch, and are dotted with minute pores. Histologically, they consist of an axis of fibrous and sometimes muscle tissue, covered with mucous membrane continuous with that lining the cervical canal. When these pedunculated adenomata remain within the canal, the epithelium covering them, and the glands they contain are of the same character as those of the cervical mucous membrane. When the tumours increase in size and project into the vagina, the epithelium covering the protruding portions becomes stratified, and the glands disappear. It is necessary to avoid confounding myomata of the uterine cervix with pedunculated adenomata.

Adenomata of the sessile and pedunculated kind are not confined to women, but occur also in female monkeys.

Racemose Adenoma. — This rare variety of tumour resembles a bunch of grapes hanging from the neck of the uterus; the various grape-like bodies or "berries" are of a bluish-red colour during life. When seen projecting into the vagina the appearance is not unlike that of a hydatid mole protruding from the uterus. These tumours vary in size; some are as large as walnuts, and specimens have been seen as large as the fist. The whole of the vaginal portion of the cervix may be involved, or the tumour grows from a limited area.

In many of the cases the grape-like bodies have thin translucent walls, and resemble the cystic projections seen on the surface of a pedunculated rectal adenoma; they are cysts lined with columnar or subcolumnar epithelium distended with mucus. When the tumour is very rich in mucous glands the tumour is usually covered with a thick layer of tenacious mucus. The surface of the tumour is sometimes covered with stratified epithelium arranged in an undulating manner, continuous with that covering the vaginal surface of the neck of the uterus.

Carcinoma.—Cancer may begin in any part of the cervical canal, but it appears to be more prone to affect the lower than the upper half. Structurally it is a caricature of the glands of the canal. The disease spreads rapidly and infiltrates the connective tissue of the broad ligament, the vesico-vaginal and

recto-vaginal septa. It ulcerates early and involves that portion of the cervix projecting into the vagina; later it extends to the lower part of the body of the uterus; and in the last stages of the disease this organ becomes completely hollowed out by ulceration, until nothing but a thin layer of muscle tissue covered by peritoneum remains. As in glandular carcinoma in general, the adjacent lymph glands are quickly implicated—first, those lying in the course of the internal iliac artery, and then the lumbar glands.

Dissemination is frequent; secondary deposits occur in the liver and lungs. Deposits are met with in the bones, but not with the same frequency as in mammary cancer.

Cancer of the cervical canal, like epithelioma of the vaginal portion, leads to perforation of the anterior and posterior vaginal septa, so that urinary and fæcal fistulæ complicate the later stages of the disease.

When the broad ligaments are extensively infiltrated the ureters become involved; this leads to dilatation of the renal pelves. As cystitis is a common complication of carcinoma of the cervix this, in conjunction with the interference with the ureters, serves to explain the almost constant presence of suppurative pyelitis and nephritis found during post-mortem examinations of women with uterine cancer. A very large proportion of these patients exhibits marked uræmic symptoms in the later stages of their lives.

Among other complications of cancer of the cervix, especially when it extends to the body of the uterus, must be mentioned pyo-salpinx and hydro-salpinx. In these cases the dilated tubes are rarely thicker than the thumb, but they are a source of danger inasmuch as perforation occasionally occurs and sets up infective peritonitis. Exceptionally the cancer perforates the body of the uterus. When this happens peritonitis may ensue and quickly cause death; in some instances the carcinomatous material becomes distributed over the peritoneum, and small knots form upon the serous surfaces of the intestine, liver, spleen, etc. This distribution of the cancer may lead to an effusion of blood-stained fluid into the belly, sometimes in considerable quantity, or to agglutination of coils of intestine, each cancerous nodule being the focus of a limited area of peritonitis. Occasionally actual

perforation of the uterus is prevented by a piece of intestine becoming adherent to the uterus at the spot where the disease is approaching the surface: adhesion of intestine in this way may take place between the uterus and small intestine, but I have several times found the transverse colon adherent to the uterine fundus, this part of the large intestine being in the form of the omega-, or U-shaped colon. It is important to bear this in mind, because when a fæcal fistula complicates cancer of the uterus it is usually attributed to a communication with the rectum or sigmoid flexure, and these are the common situations; but in some cases the fistula is in the transverse colon.

Cancer of the cervix uteri is very common between forty and fifty; many cases occur between thirty and forty. Before thirty the disease is rare, but I have observed undoubted cases in women of twenty-three, twenty-five, and twenty-six years of age.

THE BODY OF THE UTERUS.

Adenoma.—Innocent glandular tumours of the uterine cavity, to judge from recorded cases, are very rare. This is probably due to the fact that adenomata in this situation assume the form of uterine polypi, and as these tumours are rarely submitted to histological investigation their nature is overlooked. Adenomata of the uterine mucous membrane are pedunculated tumours, and have an appearance very similar to rectal adenomata; it is possible that on this account they are sometimes described as mucous polypi. Microscopically these tumours consist of cystic spaces lined with columnar epithelium, the cavities being filled with mucus.

Carcinoma.—Primary cancer of the body of the uterus is rare. Histologically, it mimics the peculiar tubular glands which exist in the mucous membrane lining the uterine cavity. Very few cases of this affection have been described, because when the patients come under observation the disease is usually regarded as some form of endometritis and treated by scraping and the like.

Of the early stages of cancer affecting the body of the uterus nothing is known. The disease remains for a long time restricted to the cavity of the uterus, and occasionally creeps

into one or both Fallopian tubes; but it very rarely involves the mucous membrane of the cervical canal, save in the very late stages, and after it has extensively destroyed the muscular substance of the uterus. It is also apt to perforate the uterine wall and lead to adhesion between it and the intestine.

Cancer of the body of the uterus is rare before the age of forty-five; it is most frequent at, or subsequent to, the menopause. Most of the cases occur between the fiftieth and seventieth years.

The signs that usually attract attention are the occurrence of fitful hæmorrhages after the menopause, followed by profuse and often offensive discharges of purulent material from the uterus.

THE FALLOPIAN TUBE.

Adenoma.—The Fallopian tube is a rare locality for an adenoma, but a few examples are known, and these present some interesting features.

The tumour takes the form of papillomatous-like masses sprouting from the mucous membrane and distending the tube. The processes may have a dendritic appearance, or assume the form of grape-like masses, resembling somewhat the curious condition known as hydatid mole.

Microscopically these tumours contain glandular recesses lined with columnar epithelium; the disposition of the parts resembles the recesses of the tubal mucous membrane.

A curious clinical feature associated with these tumours is the occurrence of hydroperitoneum, due to the fact that the presence of an adenoma in the tube does not lead to occlusion of its ostium, hence the secretion from the tube leaks into the peritoneum and leads to an effusion of fluid.*

Carcinoma.—Primary cancer of the Fallopian tube is an excessively rare affection—so rare, indeed, that there is little reliable evidence forthcoming concerning it. As yet it is impossible to write a general account of the disease either from a clinical or pathological point of view. Occasionally cancer originating in the mucous membrane of the cavity of the uterus will invade the tubes, and it is possible that a

* For further details of adenoma of the tube my book on "Diseases of the Ovary and Tubes" may be consulted.

primary carcinoma of the tube would extend to the uterine mucous membrane; but of this we have no evidence. In the meantime, as an example of the method in which suspected cases should be investigated, reference may be made to Doran's able account of a probable case of primary cancer of the Fallopian tube.*

Treatment.—The most satisfactory method of dealing with **adenoma** (erosion) of the neck of the uterus, consists in slightly dilating the canal and removing the adenomatous tissue with a sharp scoop or a curette, and then carefully searing the surface with Paquelin's cautery. This simple treatment is effectual when adenoma complicates a lacerated cervix, and is often as satisfactory as the operation known as trachelorraphy.

Carcinoma.—A study of the pathological tendencies of uterine cancer is of the first importance as a prelude to its treatment, because it would certainly be inferred from experience acquired in the treatment of mammary cancer that if it be desirable to remove a cancerous uterine cervix, the interests of the patient would be best served by the entire removal of the uterus.

Dr. Williams† has clearly pointed out that the tendency of cancer of the cervix, in its early stages, is to infiltrate the parametric tissue rather than to extend upwards and invade the body of the uterus. Cases are occasionally observed in which the disease even in its early stages involves the body of the uterus, but these are exceptional.

The great difficulty in the operative treatment of uterine cancer lies in the circumstance that the disease is so insidious, and in the majority of patients, has involved the tissues so extensively before the cases come under observation, that an operation for the adequate removal of the disease is attended with so much immediate danger, while the probability of prolonging life is so very remote that few surgeons are disposed to urge such measures upon their patients.

The important question to decide in the treatment of cancer involving the cervical canal is this:—*When the disease is recognised early, and whilst still limited to the cervix, is it*

* Trans. Path. Soc., vol. xxxix. 208, and vol. xl. 221.

† "Cancer of the Uterus."

sufficient to amputate the cervix only, or should the whole uterus be extirpated?

Dr. J. Williams is very emphatic in the opinion that in such cases the removal of the cervix is sufficient, and a study of the arguments he adduces would appear to establish this. The view has been severely criticised by a few obstetric physicians who maintain that the whole uterus should be extirpated.

Published statistics relating to this matter indicate that when it is possible to remove the disease completely by limiting the operation to the cervix it is the safer measure, and offers a good prospect to the patient, the risk to life, so far as the operation is concerned, being reduced to a minimum.

The rules for the treatment of uterine cancer may be formulated thus:—

1. Amputation of the vaginal segment is sufficient when the cancer is limited to the lower portion of the cervix.
2. When the cancer has extended to the upper segment of the cervical canal it will be necessary to perform supra-vaginal amputation of the cervix.

In primary cancer of the body of the uterus the whole organ should be removed through the vagina.

When the cancerous ulceration has extended beyond the uterine tissues operative interference is worse than useless.

CHAPTER XXIX.

GROUP III.—DERMOIDS.

Dermoids are tumours furnished with skin or mucous membrane occurring in situations where these structures are not found under normal conditions. They only possess tissues which naturally belong to skin or mucous membrane.

Dermoids may be arranged in four genera:—

I. Sequestration dermoids.
II. Tubulo-dermoids.
III. Ovarian dermoids.
IV. Dermoid patches.

Each genus contains at least two species that occur in definite situations and present structural peculiarities. The simplest dermoids belong to the first genus, the most complex are found in the ovary.

SEQUESTRATION DERMOIDS.

Dermoids belonging to this genus arise in detached or sequestrated portions of surface epithelium, chiefly in situations where, during embryonic life, coalescence takes place between skin-covered surfaces.

Dermoids of the Trunk.—These occur strictly in the regions where the lateral halves of the body coalesce. This line of union, commencing immediately below the occipital protuberance, extends along the middle of the back to the coccyx; it then passes through the perineum (scrotum and penis in the male) and upwards through the umbilicus, thorax, neck and chin, to terminate at the margin of the lower lip.

Dermoids are rare along the dorsal part of this line, and when they do occur are apt to be mistaken for spina bifida cysts. In at least one instance a dermoid has been detected in association with spina bifida occulta. The parts are shown in section in Fig. 123. The patient was a child two years old; the skin covering the defective spines presented the hair-field usual in these cases. In the tissues immediately over the stunted spines there was a dermoid containing the usual pultaceous material and hairs. The specimen was dissected by

Mr. Gilbert Barling, who kindly afforded me an opportunity of examining it.

Theoretically, dermoids should occur with tolerable frequency along the mid-dorsal line. In a case described by Dr. Wild* (which I had an opportunity of examining), a large dermoid projected from the lumbo-sacral region of a man aged twenty-two years. It was congenital, and had been regarded as a spina bifida cyst. The swelling had never caused the man inconvenience until a few days before his admission into hospital, when it became inflamed and then burst, discharging a quantity of foul-smelling sebaceous material mixed with hairs. The cavity was freely opened and cleared of decomposing material. The skin lining the interior of the dermoid was beset with pores of large size, corresponding to the orifices of sweat glands; when the patient perspired, drops of sweat could be seen oozing from these pores. This skin also contained nerves, for the man could localise the prick of a pin on the interior of the dermoid, as easily as one made upon the skin surrounding the tumour. When the tumour was removed, the spinous processes underlying it were found to be unusually short and surrounded by fat. (Fig. 124.)

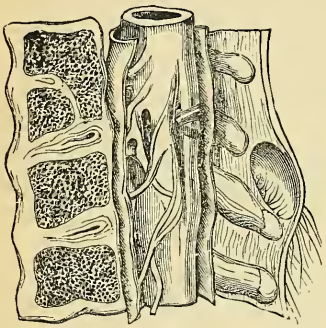

Fig. 123.—Section of three thoracic vertebræ with a small dermoid situated over two stunted spinous processes.

Faulty coalescence of the cutaneous covering of the back often occurs over the lower sacral vertebræ, and gives rise to small congenital sinuses known as "post-anal dimples." These recesses are lined with skin furnished with hairs, sebaceous and sweat glands. Sometimes they measure 10 mm. in depth. As a rule, they are single and often accompany lumbo-sacral spina bifida. Though most commonly seen over the coccygeal, or the last two sacral vertebræ, I have seen them as high as the fourth lumbar vertebra, and always exactly in the middle line.

* Trans. Path. Soc., vol. xl., p. 386.

These post-anal dimples are interesting, for—as will be shown afterwards—in many situations where sequestration dermoids occur, similar cutaneous recesses are also seen. An examination of such a sinus serves to show that if its external orifice became occluded, without the deeper parts becoming obliterated, we should have the germ of a dermoid, for the numerous glands in the walls would be active, and their

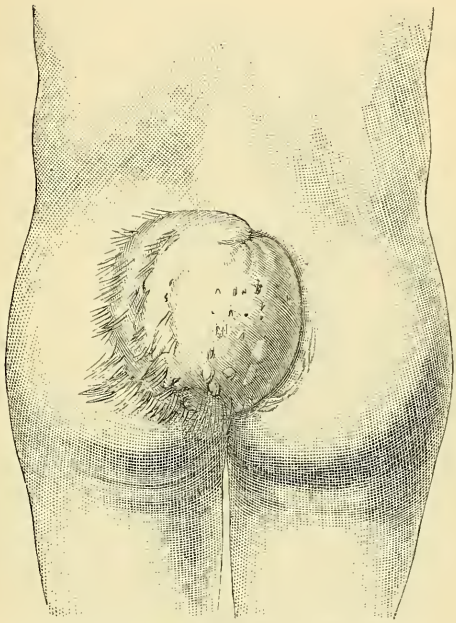

Fig. 124.—Dermoid in the lumbo-sacral region of a man twenty-two years of age.

secretion, with the shed epithelial scales and hairs, would soon cause it to enlarge and assume such proportions as to be clinically recognised as a tumour.

A good physiological type of such dermoids is furnished by the interdigital pouch of the sheep. This pouch—as shown in Fig. 125—lies between the digits, and all the dissection required to expose it is to separate the digits with a sharp knife, keeping close to the phalanges of one or other side. In adult sheep it is always full of shed wool and grit. Sometimes its orifice is occluded and it becomes a retention cyst; suppuration follows, much to the sheep's discomfort.

The walls of this pouch are full of very large glands. In order to get satisfactory sections it is necessary to obtain the digits from a still-born lamb, for as soon as lambs run about grit gets into the pouch and spoils the edge of the knife.

Dermoids of the Scrotum.—There are many good reasons for believing that the majority of dermoids reported as arising in the testicles were really scrotal in origin. This was clearly the case in a specimen described by Bilton Pollard* as a dermoid of the testicle. The dermoid was situated on the left side of the scrotum, between the testicles, and adhered to the back of the left one outside the tunica vaginalis. It contained putty-like material in which there were a few grey hairs. The cyst was lined with stratified epithelium; papillæ and sebaceous glands were detected.

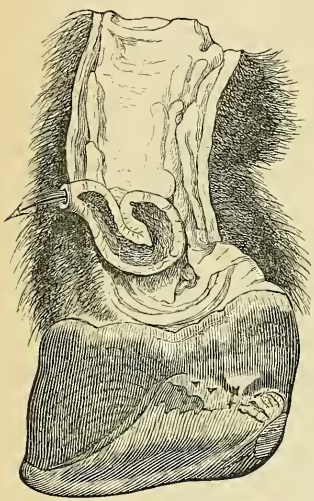

Fig. 125.—Median aspect of a sheep's digit, showing the interdigital pouch.

It is usually stated in text-books that dermoids of the testis are common. This is very improbable, for very few cases are to be found in surgical literature, and the details in most cases are insufficient to enable me to determine whether the dermoids were scrotal or testicular. For evidence as to the rarity of testicular dermoids Mr. D'Arcy Power's † paper should be consulted. In records of future cases it will be necessary to pay particular attention to the relation the dermoids bear to the testicle, tunica vaginalis, and scrotum.

Dermoids have been found in the **inguinal canals** of men closely associated with the spermatic cord, and it may be easily imagined that in such situations they run the risk of being confounded with herniæ. Such specimens are excessively rare, and as I have not had an opportunity of

* Trans. Path. Soc., vol. xxxvii., p. 342.

† Trans. Path. Soc., vol. xxxviii., p. 242.

investigating one, I am unable to offer an explanation of their mode of origin.

Dermoids of the Thorax.—Judging from the few available records, dermoids of the thorax are very uncommon. They occur in two situations—viz., on the anterior aspect of the sternum and in the thoracic cavity. Dermoids on the front of the sternum are situated in the middle line near the junction

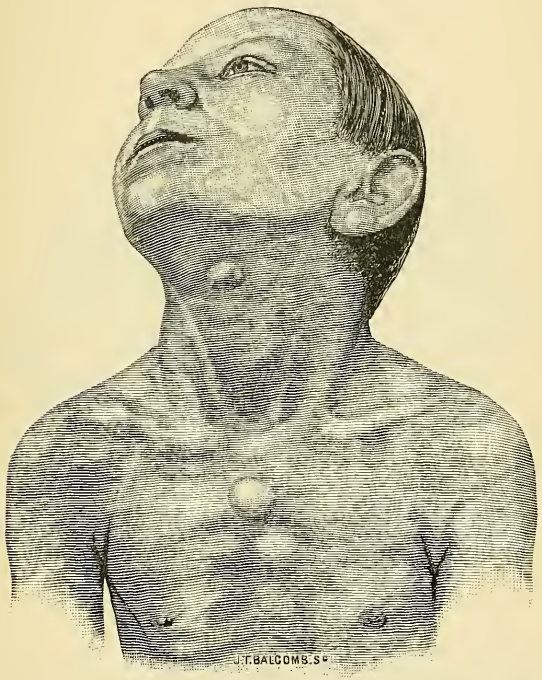

Fig. 126.—Dermoid situated over the junction of the manubrium and gladiolus of the sternum; there was also a dermoid near the left cornu of the hyoid bone. The boy was nineteen years of age. (*After Bramann.**)

of the manubrium with the gladiolus. (Figs. 126 and 127.) Cahen's† patient was a child eight months old. The mother stated that at birth the tumour was no larger than a pea, but had slowly increased in size. It was extirpated, and found to contain sebaceous material; the wall of the cyst was lined with

* Langenbeck's "Archiv," bd. xl.

† Zeitschrift für Chir., bd. xxxi. 370.

stratified epithelium, and it contained sweat-glands. Clutton* described a specimen which he removed from a female thirty-nine years of age. The tumour contained eleven ounces of pultaceous material. The wall of the cyst was lined with skin, and one hair was found growing from it. No glands were detected. When the patient was six weeks old the tumour was as big as a pea: at the age of nineteen it had attained

Fig. 127.—Presternal dermoid. (*After Cahen.*)

the dimensions of an egg, and continued slowly to increase in size. When the patient came under Clutton's care the tumour hung pendulous between the breasts. The history of the case clearly indicated that the dermoid had been from the first situated over the middle of the sternum.

Intrathoracic dermoids seem to be equally rare. Hale White† met with one as large as a Tangerine orange, attached to the anterior and right surface of the pericardium, and by a few adhesions to the right lung. The cyst contained sebaceous matter and hair.

* Trans. Path. Soc., vol. xxxviii. 393.

† Trans. Path. Soc., vol. xli. 283.

Albers* described and figured a dermoid of the thorax that occurred in a woman twenty-eight years old. At the age of fifteen it was noticed she brought up hairs on coughing. At her death a large cyst, furnished with pilose skin and fleshy protuberances, was found in connection with the left lung.

A case fully reported in regard to clinical details by Dr. Douglas Powell and Mr. Godlee† was observed in a lady

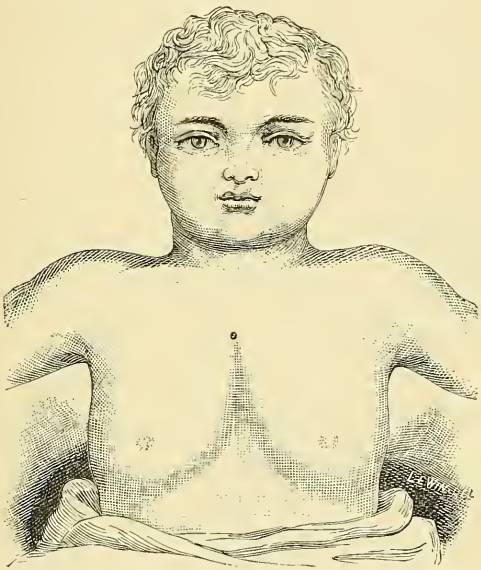

Fig. 128.—Sternal dimple. (*After W. W. Ord.*)

twenty-nine years of age. She presented signs of empyema, and whilst under operative treatment it was ascertained that a large dermoid occupied the right pleura and extended to the summit of the lung. The interior of the dermoid contained hair and fleshy protuberances as in Albers' case. The patient died four years after the cyst had been opened, but no post-mortem examination could be obtained. In this case the cyst communicated with a bronchus, because the patient remembered that she had coughed up hair.

* Atlas der Path. Anat., 1846, tab. xxxiv.; und Erläuterung, s. 342.

† Med.-Chir. Trans., vol. lxxii. 317.

At first glance it would seem difficult to account for the presence of a large dermoid within the thorax, and it has been thought that, as dermoids are not uncommon at the episternal notch, a cyst in this situation had burrowed downwards into the superior mediastinum and encroached upon the pleura. A review of the mode of development of the sternum throws much clear light on the subject. The two lateral halves of the sternum are, in the early embryo, widely separated from each other; gradually they coalesce in the middle line. Every anatomist is aware that this median coalescence is extremely liable to be faulty, and conditions occur like those which, happening in connection with the medullary folds, produce spina bifida. In this line of coalescence, so far as sternal dermoids are concerned, we may get skin-lined recesses resembling the coccygeal dimples (Fig. 128). These sternal recesses, or dimples, occur near the junction of the manubrium with the gladiolus, and may be more than a centimetre deep. Should a piece of skin become sequestrated during coalescence of the thoracic walls, it may, during the development of the sternum, be dislocated forwards to the outer surface, or backwards towards the mediastinum, conditions in every way parallel to the variations in the position of cranial dermoids. So long as a dermoid on the deep surface of the sternum remains small it will cause no trouble, but it is easy to understand that a large tumour, as in Clutton's patient, would, if projecting into the thorax, encroach on the pleura; even then it would not produce much disturbance so long as air did not gain access to it: but if by pressure the wall of the cyst becomes so thin as to allow air to enter its cavity, or an actual communication forms between the cyst and a bronchus or the air-sacs of the lung, then suppuration, with all its disastrous consequences would ensue.

CHAPTER XXX.

SEQUESTRATION DERMOIDS (*continued*).

Facial Dermoids.—Dermoids occur on the face in certain definite positions, such as the inner and outer angles of the orbit; the upper eyelid: in the naso-facial sulcus: on the cheek slightly posterior to the angle of the mouth; in the middle line of the chin, and on the nose. To these, for the sake of convenience in description, may be added dermoids of the palate.

In order to appreciate the origin of dermoids in these situations it is necessary to bear in mind the relation of the facial fissures in the embryo, which in the adult are represented by the orbits, lachrymal ducts, mouth, and certain furrows in the lips and cheek.

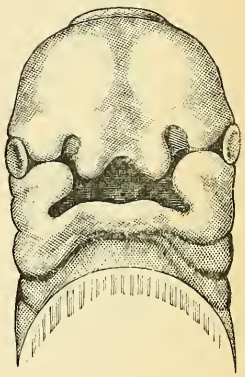

Fig. 129.—Head of an early human embryo, showing the disposition of the facial fissures. (*After His.*)

In the early embryo the central portion of the face is represented by an opening from which five fissures radiate. The upper pair (Fig. 129) are the orbito-nasal; the two lower fissures are termed mandibular, and a fifth, not shown in the figure, the intermandibular fissure. The median fold projecting into the opening from above is the fronto-nasal process, which ultimately forms the nose. As it develops, a rounded prominence known as the globular process, forms at each angle and gives rise to a portion of the ala of the nostril and the corresponding premaxilla. These globular processes fuse together in the middle line to form the central piece, or philtrum, of the upper lip. The elongation of the fronto-nasal process necessarily lengthens the orbito-nasal fissures. Eventually the sides of the fronto-nasal plate coalesce superficially with the maxillary processes in such a way as to leave a cleft on each side, which becomes the orbit, the line of union being permanently indicated in the adult by the naso-facial sulcus or groove, and indicated still more deeply

by the lachrymal duct, which is a persistent portion of the original orbito-nasal fissure. The union of the fronto-nasal plate with the maxillary processes completes the nose, cheeks, and upper lip.

The above account indicates in a general way the relation of these fissures to each other; but it will be necessary in considering dermoids arising in them to mention certain details connected with each. But here it may be mentioned that the

Fig. 130.—Mandibular tubercle associated with a malformed auricle.

defects associated with any of them are of three kinds:—1, the fissure may persist; 2, it may close imperfectly and leave a recess or puckering of the skin; 3, portions of the surface epithelium may be sequestrated and give rise to dermoids.

These conditions may be illustrated by the mandibular fissure. In the embryo this fissure or cleft is relatively more extensive than the opening of the mouth which in the adult ultimately represents it. In fishes the whole of the mandibular fissure persists as the gape; but in mammals the dorsal portions of the clefts are obliterated by the union of their margins, leaving the central portion as the mouth. Persistence of the whole length of the fissure is a rare defect, and known as **macrostoma**. Excessive closure of the fissure produces **microstoma**. Imperfect union of those sections that normally

coalesce gives rise to slighter imperfections, of which some examples will now be described.

Occasionally we find on one or both cheeks of children, at a spot varying from 2 to 4 cm. behind the angle of the mouth, a small nodule rarely exceeding a rape-seed in size. Sometimes there is a depression or sinus in the cheek surmounted

Fig. 131.—Right side of the head of a fœtus, showing a large mandibular tubercle and an accessory tragus.

by the nodule. In a fair proportion of cases the buccal mucous membrane presents a shallow recess, sometimes a sinus, and occasionally a white cicatrix at a spot exactly corresponding to the nodule on the cutaneous surface of the cheek.

These **mandibular tubercles** and **recesses** are frequently associated with malformations of the corresponding auricles. (Fig. 130.)

Mr. Cowell described a case in which a mandibular tubercle was associated with a puckered recess in the mucous membrane of the cheek, two cutaneous tubercles on the tragus

of the corresponding auricle, and a coloboma of the upper eyelid. (Fig. 179.) The largest specimen which has yet come under my observation occurred in a still-born fœtus. Projecting from the right cheek, 2 cm. behind the angle of the mouth, was a nodule the size of a rape-seed, and immediately behind this a pedunculated body 8 mm. long. On the corresponding pinna there was an accessory tragus. (Fig. 131.)

Histologically the tubercle on the cheek consisted of dense

Fig. 132.—Pierrot's head, to show the mandibular tubercle.

connective tissue traversed by blood-vessels and covered with skin beset with lanugo, and richly supplied with sweat glands and sebaceous glands of large size. Thus it was structurally a small dermoid tumour. The left cheek and pinna were normal. The fœtus had a large spina bifida sac (meningomyelocele) in the lumbar region.

In connection with these tubercles it will be interesting to mention that Mr. Noble Smith drew my attention to a bronze bust in the Art Gallery, Birmingham, labelled "*Bust of Cæcilius Jucundus, a money lender. Bronze. The original found in Pompeii, and now in the National Museum, Naples.*" Behind the angle of the mouth on the left cheek there is a well-marked mandibular tubercle.

It may here be pointed out that in many mammals, especially dogs, small cutaneous nodules furnished with vibrissæ may often be detected in a line with the angle of the mouth. These nodules occupy positions identical with

Fig. 133.—Median fissure of the lower lip. (*Wölfler.*)

the mandibular tubercles when they occur on the cheeks of children. (Fig. 132.)

There is very little relationship between pathology and poetry, but that very philosophical pathologist, Dr. Samuel Wilks, in reference to my observation that the usual position of the mandibular tubercle and recess corresponds with that of the dimple in the baby's cheek, drew my attention to the following passage in his Harveian Oration, 1879. "From any point of view we take, and upon whatever subject we fix our gaze, we come to the conclusion that the greatest discovery ever made by man about himself, and

of the earth of which he forms a part, is the doctrine of evolution."

> "The softest dimple in a baby's smile
> Springs from the whole of past eternity,
> Tasked all the sum of things to bring it there."

Wilks observed to me how little the poet (Miss Bevington) divined that there is a material basis for these three pretty and significant lines.

Similar defects are met with in the **intermandibular**

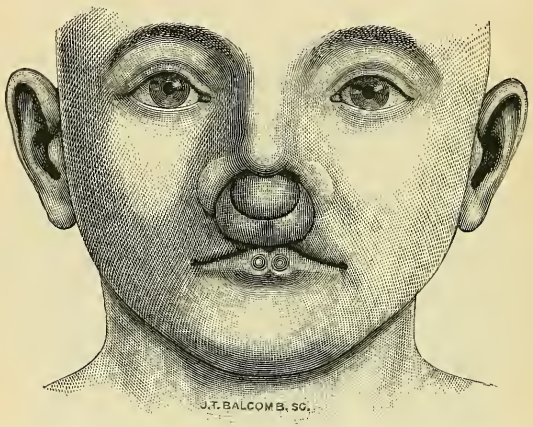

Fig. 134.—Congenital fistulæ in the lower lip of a child, associated with double hare-lip. (*After Madelung.*)

fissure. Thus, when the mandibular processes fail to coalesce, the result will be a median cleft in the lower lip extending to or even beyond the chin. (Fig. 133.) Median clefts of this kind are excessively rare. Occasionally such a defect is associated with a dermoid* or a pair of small nodules in the skin. In terriers such nodules are almost constantly present between the symphysis and the body of the hyoid bone. In children with double hare-lip two sinuses are sometimes seen in the mucous membrane of the lower lip. Their orifices are indicated by small but prominent papillæ. The sinuses are large enough to admit a probe, and they are in some cases 2 cm. deep. Mucoid fluid exudes from these recesses, it is furnished by mucous glands which beset the membrane

* Lannelongue, "Kystes Congenitaux," 1886, p. 46.

lining their walls. Several examples of this condition have been recorded, and a good specimen observed and described by Madelung is represented in Fig. 134. In this case the child was the subject of double hare-lip and cleft palate. The two conditions seem to be frequently associated. Madelung's patient died four days after operation: the lower lip was examined microscopically, and some excellent drawings illustrating the relations of the glands to the sinuses accompany the paper.*

Arbuthnot Lane† reported a case of this nature in a lad thirteen years of age with double hare-lip.

I have little doubt that these sinuses are due to faulty

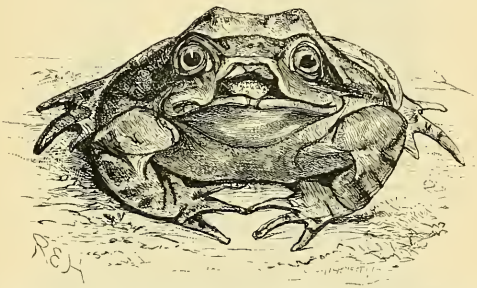

Fig. 135.—Hare-lip in a frog, associated with a persistent intermandibular fissure. The forelimbs are webbed.

closure of the intermandibular fissure; this view of their origin is strengthened by an observation of Feurer,‡ in which he detected in the upper lip of a lad, twenty years old, a similar sinus on the right side of the philtrum; it corresponded exactly to the termination of the naso-facial fissure, *i.e.*, exactly in the line of a right-sided hare-lip.

Dermoids of the Orbito-nasal Fissure.—Dermoids appear in the course of this fissure in three definite situations. Of these, by far the most frequent is the outer angle of the orbit, where they form rounded tumours, rarely exceeding the dimensions of a cherry; they lie in close relationship with the pericranium covering the frontal bone, which is often deeply hollowed to accommodate them. Dermoids in this

* Langenbeck's "Archiv," bd. xxxvii., s. 271.

† Clin. Soc. Trans., vol. xxiv., p. 230.

‡ Langenbeck's "Archiv," bd. xlvi. 35.

region vary somewhat in regard to their position; sometimes they are quite close to the external angular process of the frontal bone, or they may be 2 cm. or more posterior to it (Fig. 136); exceptionally they are on a level with, or even lie beneath, the eyebrow.

Dermoids at the inner angle are far less frequent. Of this the example given in Fig. 137 was observed in a middle-aged man. In this situation the tumour may extend beyond the

Fig. 136.—Dermoid at the outer angle of the orbit.

bone and lie in intimate relation with the dura mater. It is very necessary to remember this in attempting the extirpation of the dermoid. In some cases the tumour may have a peduncle continuous with the dura mater. Under such conditions the dermoid may transmit the cerebral pulsation; it is then apt to be mistaken for a meningocele. This is a less serious error than mistaking a meningocele for a dermoid and following up the error by attempting its extirpation.

In addition to dermoids at the orbital angles, they sometimes occur in the tissues of the upper eyelid, unconnected either with bone or periosteum. These small dermoids probably arise in the fissure between the fronto-nasal plate and the cutaneous fold from which the eyelid is formed. The fissure

between the two parts which form an eyelid sometimes persists. To this defect the term coloboma of the eyelid is applied. (*See* Fig. 179.)

Dermoids in the lower section of the **orbito-nasal fissure** are very rare. When present they occupy the naso-facial sulcus, as in Fig. 138.

Nasal Dermoids.—It is necessary to point out that all dermoids arising in connection with the nose are not associated

Fig. 137.—Dermoid at the inner angle of the orbit.

with the orbito-nasal fissure. For instance, in the case of the child in Fig. 139, there is a small dermoid exactly in the middle line at the root of the nose. This part of the face is not traversed by a fissure in the embryo. Nasal dermoids, unassociated with the orbito-nasal fissure, appear either as complete cysts, or as small congenital sinuses in the skin of the nose. Sometimes such sinuses are merely shallow recesses in the skin; in other cases tufts of hair project from their orifices.

The mode by which such dermoids arise is in all respects identical with that which gives rise to dermoids on the scalp.

In the skull of the early embryo, the naso-frontal plate, which ultimately forms the nose, consists of a lamina of hyaline

cartilage covered externally by skin and internally by mucous membrane. After the third month sections made through the nasal capsule, immediately anterior to the ethmoid, show that the skin is being dissociated from the underlying cartilage by bony tissue, which eventually becomes the nasal bones.

Fig. 138.—Dermoid arising in naso-facial sulcus. (*After Bramann.**)

Ultimately the cartilage disappears as a result of the pressure exercised by these bones. It is reasonable to believe that in the gradual separation of the skin from the cartilage of the fronto-nasal plate by the intrusion of the nasal bones, small portions of skin or epithelium become sequestrated and eventually develop into dermoids. This explanation is more fully set forth in the chapter on dermoids of the scalp and dura mater.

It is necessary to mention that dermoids at the root of the

* Langenbeck's "Archiv," bd. xl., 101.

nose often have such extremely thin walls as to be translucent like a hydrocele of the tunica vaginalis testis. Such dermoids contain a fluid like oil.

Palatine Dermoids.—In the early embryo the nasal and buccal cavities form a common chamber. Gradually the

Fig. 139.—Nasal dermoid in a child.

palatine processes of the maxillæ and palate bones converge to the middle line and form the hard palate. For a period, however, the palate is traversed by a fissure, which eventually closes from before backward. Occasionally this union never takes place, and the deformity, cleft palate, is the result. Small bodies known as "epithelial pearls" are sometimes met with in the middle line of the palate; they are not uncommon in the mouths of children at birth, hanging by short, thin pedicles. They are composed of concentric masses of epithelial cells.* The mode by which these pearls arise is discussed in chapter xxxviii.

* Lebouc, "Arch. de Biologie," vol. ii. 400.

Dermoids sometimes arise in the palate; they take the form of tumours, inasmuch as the skin covers the outside of the mass instead of lining a cavity; the tumour is usually composed of connective tissue containing striped muscle tissue and cartilage. The dermoid may project either from the buccal or pharyngeal aspect of the soft palate. It is occasionally difficult to determine when the tumour projects into the pharynx, whether it grows from the soft palate or roof of the pharynx.* Lambl† reported a case in which a pharyngeal dermoid in a child became detached and was swallowed. Next day it was voided by the anus.

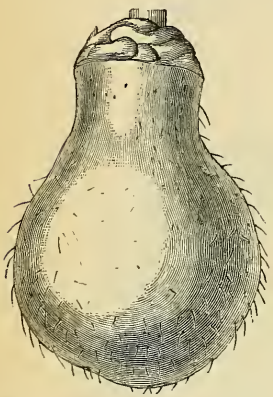

Fig. 140.—Pedunculated dermoid tumour from the pharyngeal aspect of the soft palate. (*Arnold.*)

Adenomata of the Palate.—A somewhat rare species of tumour is occasionally met with in the palate which may provisionally form an appendix to palatine dermoids. The tumours in question are often referred to under the name of palatine adenomata. They are usually oval in shape, and vary in size from a cob-nut to a hen's egg: the latter size is exceptional. The tumours are more frequent in the soft (Fig. 140) than the hard palate, and as a rule are distinctly encapsuled; even when pendulous the tumour has a capsule. In structure palatine adenomata are very complex; some possess glandular tissue with ill-formed ducts and acini, and in their histological features mimic cancer, whilst the stroma in which these gland-like bodies are embedded imitates sarcomatous tissue. Epithelial pearls are often abundant and may contain horn. Myxomatous tissue is sometimes present, and Hutchinson‡ has published the details of a palatine adenoma which contained lymphoid follicles. Palatine adenomata occur at puberty or between the thirtieth and fiftieth years.§ They are innocent tumours.

* Hale White, Trans. Path. Soc., vol. xxxii. 201.

† Virchow's "Archiv," bd. cxi. 176.

‡ Trans. Path. Soc., vol. xxxvii. 490.

§ Stephen Paget, Trans. Path. Soc., vol. xxxviii. 348.

CHAPTER XXXI.

SEQUESTRATION DERMOIDS (*concluded*).

Dermoids of the Scalp and Dura Mater.—The common situations for dermoids of the scalp are over the anterior fontanelle and occipital protuberance. In these situations they may be confounded with sebaceous cysts or with meningoceles. Dermoids of the scalp often have a thin pedunculated

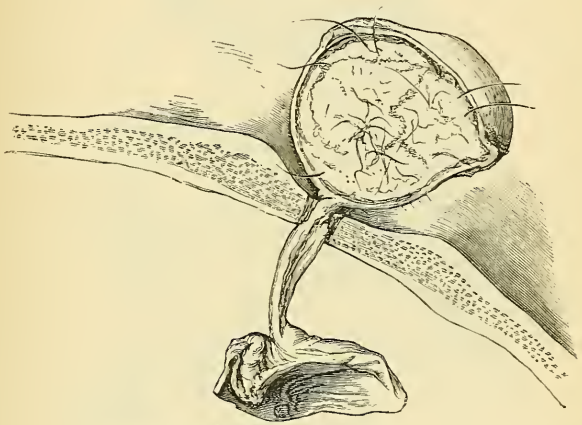

Fig. 141.—Dermoid of the scalp connected by a pedicle with the dura mater. (*Museum, Middlesex Hospital.*)

attachment to the dura mater, the pedicle traverses a hole in the underlying bone, unless the cyst is over a fontanelle.

The specimen represented in Fig. 141 was long preserved in the museum as an example of a sebaceous cyst or wen; its connection with the dura mater induced me to examine it, and I ascertained that the cyst contained skin and hair. The term "wen" used to be applied indifferently to sebaceous cysts and dermoids of the scalp. Sir Astley Cooper,* in his well-known essay on "Encysted Tumours," even included orbital dermoids among wens. In describing them, he writes:—"The largest size I have known them acquire has been that of a common-sized cocoa-nut, and this grew upon the head of a man named

* "Surgical Essays," vol. ii., p. 213, 1818.

Lake, who kept the house called the 'Six Bells' at Dartford. It sprang from the vertex, and gave him a most grotesque appearance, for when his hat was put on it was placed upon the tumour and scarcely reached his head. The cyst is in the

Fig. 142.—Head of the man Lake with a large dermoid. (*From a cast in the Museum, St. Thomas's Hospital.*)

collection at St. Thomas's Hospital, also an excellent cast of his head taken just prior to the operation."

A drawing of the cast is given in Fig. 142. I have examined the cyst in the museum and find that it is a typical dermoid. This is far the largest dermoid of the scalp with which I am acquainted. The cyst contained a number of round balls, some having a diameter of 1 cm. These consisted of epithelial cells mixed with fat. Some of the balls have been preserved.

Sibthorpe* described a specimen which he removed from

* *Brit. Med. Journal*, 1888, vol. i., p. 350.

the scalp of a young Hindu. The tumour had been present since birth. When excised it was of the shape and size of a cocoa-nut. It contained short hairs, grease, and fat cells.

When dermoids are situated over the anterior fontanelle they may easily be mistaken for meningoceles.

Arnott* published the details of an instructive case of dermoid situated over the anterior fontanelle in an infant a few days old. The tumour exactly resembled a meningocele, "rising and falling with regular pulsation, and swelling when the child coughed"; the resemblance was so strong that it

Fig. 143.—Congenital tumour over the anterior fontanelle. (*After Hutchinson.*)

was regarded as a meningocele. A few weeks later the child died from broncho-pneumonia, and the cyst was found to be a dermoid. The specimen is preserved in the museum of St. Thomas's Hospital.

Giraldés† records a case even more remarkable than this A child, three months old, had an ovoid tumour, of the size of a pigeon's egg, over the anterior fontanelle. The tumour was covered with fine white hair, and did not pulsate with respiration. It was thought to be a meningocele, and in order to establish a diagnosis it was punctured with a fine trocar, and fluid resembling that found in meningoceles was withdrawn. Notwithstanding numerous subsequent punctures, the tumour maintained its original volume. Some months later it was removed, Giraldés being still under the impression that it was a meningocele; but it was found to be a typical dermoid.

* Trans. Path. Soc., vol. xxv., p. 228.

† "Maladies Chir. des Enfants," p. 342.

The clinical characters of such tumours occurring at the anterior fontanelle may be illustrated by the case reported by Hutchinson (Fig. 143).* As the tumour distinctly filled when the child cried, it was not interfered with. At the date when the case was published the patient was a fine young man of eighteen, and the cyst had not shown any tendency to increase since birth.

Dermoids in the neighbourhood of the occipital protuberance may lie on the inner aspect of the occipital bone and are nearly always in relation with the tentorium cerebelli. Examples have been described by Turner,† Ogle,‡ Pearson Irvine,§ and Lannelongue.‖ They occurred in children, and in Ogle's case there was defective development of the squamous portion of the occipital bone. In Lannelongue's patient, a girl seven years old, the dermoid had attained the size of an orange; it produced marked symptoms, such as paralysis, amaurosis and coma, ending in death.

Although at first sight a dermoid connected with the dura mater and projecting into the brain seems to violate all embryological rules, nevertheless, when we view this membrane from a morphological standpoint, the strangeness vanishes and a satisfactory explanation is forthcoming.

Morphologically considered, the bony framework of the skull is an additional element to the primitive cranium which is represented by the dura mater, and as I have elsewhere ¶ endeavoured to show, the term extracranial should strictly apply to all tissues outside the dura mater. In surgical practice we find it convenient to regard the bones as the boundary of the skull, but morphologically this is inaccurate; the skull-bones must be regarded as secondary cranial elements. Early in embryonic life the dura mater and skin are in contact; gradually the base and portions of the side-walls of the membranous cranium chondrify, thus separating the skin from the dura mater. In the vault of the skull, bone

* "Illustrations of Clinical Surgery," vol. ii., plate xlvi.

† St. Barth. Hosp. Rep., vol. ii. 62.

‡ *Brit. and For. Med.-Chir. Review*, 1865.

§ Trans. Path. Soc., vol. xxx. 195.

‖ "Affections Congenitales," 1891, p. 49.

¶ *Journal of Anat. and Physiology*, vol. xxii., p. 28: "A Critical Study in Cranial Morphology."

develops between the dura mater and its cutaneous cap, but the skin and dura mater remain in contact along the various sutures even for a year or more after birth. This relation of the dura mater and skin persists longest in the region of the anterior fontanelle and the neighbourhood of the torcular. Should the skin be imperfectly separated, or a portion remain persistently adherent to the dura mater, it would act precisely as a tumour germ and give rise to a dermoid cyst. Such a tumour may retain its original attachment to the dura mater, and its pedicle become surrounded by bone: the dermoid would lie outside the bone, but be lodged in a depression on its surface, with an aperture transmitting its pedicle. On the other hand, the tumour may become separated from the skin by bone: it would then project on the inner surface, or between the layers of the dura mater. If this view of the origin of dermoids of the scalp be admitted, we must then slightly modify our teaching, and say that the depressions in which dermoids of the cranium are lodged arise as imperfections in the developmental process, and are not due to absorption induced by the pressure they exert: further, the fibrous connection of such dermoids with the underlying dura mater is primary, not accidental.

The relation of dermoids to the tentorium requires further consideration. A study of the development of the tentorium cerebelli will demonstrate that it is composed of two folds of dura mater, and it arises as an infolding or crease in this membrane, caused by the rapid backward extension of the developing cerebrum. The opposed surfaces of the tentorial lamellæ, like the outer surface of the dura mater in relation with the cerebrum, were originally in contact with the skin, and as the posterior margins of the bay or recess formed by the crease in the dura mater come together, a portion of the skin may become nipped or even sequestrated between the layers of the tentorium; this preserving its vitality, and in some cases its cutaneous connections, may ultimately give rise to an intracranial dermoid.

CHAPTER XXXII.

IMPLANTATION CYSTS.

These small tumours should form a group by themselves and not be included among dermoids; but their consideration in connection with sequestration dermoids is imperative, as they furnish valuable (almost experimental) evidence of the reality of the theory that this genus of dermoids arises from "rests," the results of faulty coalescence. Implantation cysts are caused by the accidental transplantation of portions of skin, surface epithelium, or hair bulbs into the underlying connective tissue. The transplanted tissue acts, in many instances, as a graft and ultimately forms a small tumour. Cysts of this character have been described as sebaceous cysts, dermal cysts and dermoids. They occur most commonly on the fingers, and especially on the fingers of women who live by sewing, shoe-makers, carpenters, and the like.

Fig. 144.—Implantation cyst from the tip of the finger.

Polaillon* has written an account of digital dermoids, and gives M. Muron the credit of first recognising the character of such cysts (1868). He says the tumours are more frequent on the palmar than the dorsal aspect of the digits, but he fails to associate them with antecedent injury, though he distinctly points out that they occur mainly on the hands of workpeople and soldiers.†

A digital dermoid in the subcutaneous tissue of the finger-tip is represented in Fig. 144. The specimen was placed at my disposal by Mr. Shattock, who described its microscopical characters thus: "It appeared as if a piece of the skin covering the pulp of the finger had been inverted." There was no clear history of old mechanical injury, but the patient was a farrier.

Implantation cysts occur in other parts of the body. Treves‡ described a case which occurred in a woman twenty-

* "Dic. Ency. des Sci. Méd.," 1884, in an admirable article, "Doigt."

† The Trans. Path. Soc., vol. xxxv. onwards, contain careful descriptions of several cases by Barker, Bowlby, Poland, and others.

‡ *Lancet*, 1889, vol. i., p. 682.

nine years of age. The tumour was situated over the external occipital protuberance, and measured 7 cm. in its long axis. It was cystic, the walls being lined internally with skin furnished with hair 5 to 8 cm. long. The cavity also contained sebaceous material and mucus. The patient affirmed that the tumour appeared eight years previously after a laceration of the scalp, the scar of which was visible at the time the tumour was removed; it was situated some little way from the cyst.

These cases are of interest, for they serve to throw light on some cysts, containing hair and wool, preserved in the museum of the Royal College of Surgeons. Two of the cysts are from sheep, and contain wool embedded in fatty matter. Unfortunately, the catalogue affords no information as to the region of the body whence they were removed. The third and fourth specimens were removed from the shoulder of a cow that had six legs. The cysts contain light hair, fatty and calcareous matter. These four specimens are Hunterian. The fifth specimen was removed from beneath the integuments of the shoulder of an ox. It contained slender black hairs, resembling those on the skin of the animal, mixed with fat. I once obtained a good example of an implantation cyst from the axilla of an ox. The cyst was as large as a billiard ball, and in structure resembled a piece of inverted skin. Fortunately, these cysts can be explained on the same lines as dermoid cysts of the fingers in man. The sticks used by cattle-drovers are armed at the end with a sharp iron spike, 2·5 cm. (1″) long, with which they "prod" the beasts, often very severely. It may be assumed that punctures produced with such an instrument may lead to the deposition of dermal grafts beneath the skin, which may give rise to dermoids in the same way as punctured wounds in the skin of men and women. Punctured wounds in sheep and oxen may also be caused by projecting nails, iron spikes, tenter-hooks, and the like.

The opinion that dermoids may arise in the subcutaneous tissues by implantation, receives the strongest possible confirmation from what we know of similar cysts of the iris and cornea associated with mechanical injury.

Iritic Cysts.—Cysts of the iris are of comparative rarity,

generally appearing as transparent vesicles situated on its anterior surface. As a rule, they are sessile, but occasionally possess a pedicle. The contents may be opaque, but in exceptional cases they have been filled with sebaceous material, such as fills the cavities of dermoids.

Mr. Hulke* has collected some valuable facts in relation to such cysts, and states that in fifteen out of nineteen cases, as well as in two reported by himself, there was distinct history of antecedent mechanical injury. He suggested that some of these cysts originated from portions of Descemet's membrane, which may have been torn from the cornea and implanted on the iris. Mr. Power mentioned to me the case

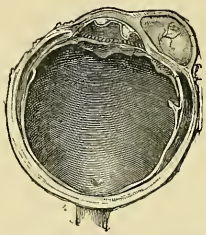

Fig. 145.—Large implantation cyst of the cornea, following an injury. (*After T. Collins.*)

of a sailor who wounded his cornea with a knife: afterwards a small cyst was found on the iris, with an eyelash sprouting from its middle. On this head we have the accumulated experimental observations of Dooremaal, Goldzieher, Schweninger, Zahn, and Masse, who introduced various kinds of tissue, such as cartilage, hairs, and conjunctiva, into the anterior chambers of rabbits' eyes. In some instances the transplanted tissues grew; in others they were absorbed or extruded from the globe.

Corneal Cysts.—In addition to the evidence furnished by implantation cysts of the iris we know that similar cysts occur in the cornea. Treacher Collins has investigated this matter, and has published some valuable researches in which he has succeeded in demonstrating that after gunshot injuries of the eyeball, blows from tip-cats, and incisions made for the extraction of cataracts, cysts, usually of small size, are liable

* "On Cases of Cysts of the Iris," R. Lond. Ophth. Hosp. Rep., vol. vi., 1869; also Hosch, "Ex. Studien über Iriscysten," Virchow's "Archiv," bd. xcix., s. 449.

to form in the cornea near the seat of injury. In some of the specimens, as for instance the eye sketched in Fig. 145, the cyst may be very large and conspicuous ; when examined microscopically, their inner walls are found lined with layers of cells identical with those covering the anterior surface of the conjunctiva. (Fig. 146.) The structure of these

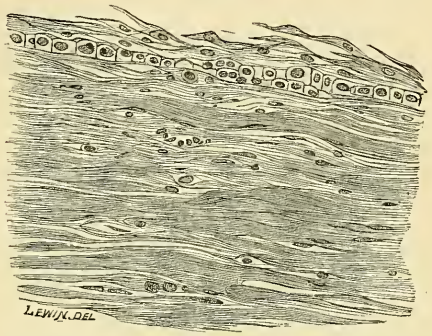

Fig. 146.—Section of the cyst in the preceding figure, highly magnified. It shows the laminated epithelium. (*After Treacher Collins.*)

cysts, taken in conjunction with the antecedent injuries, thoroughly supports the view that they arise from conjunctival epithelium transplanted into the deep tissues of the cornea. The most careful investigation into the origin and structure of corneal cysts has been undertaken by Treacher Collins,* whose communications deserve the most attentive study from all interested in this subject.

* Royal London Ophth. Hosp. Reports, vol. xii.

CHAPTER XXXIII.

TUBULO-DERMOIDS.

There exist in the human embryo certain canals and passages, many of which normally disappear before birth. Among these **obsolete canals** there are three that require especial consideration in connection with dermoids—viz., the thyro-lingual duct, the post-anal gut, and the branchial clefts. The remainder will be considered in connection with cysts.

The Thyro-glossal Duct.—The thyroid gland of man consists of two lobes united by a narrower portion or isthmus. His maintains that the three parts of this gland arise separately. The lateral lobes originate independently of the isthmus; the latter is derived from a median tubular outgrowth from the ventral wall of the embryonic pharynx known as the thyro-glossal duct. This duct bifurcates at its lower end and gives rise to the thyroid isthmus, which fuses with the lateral thyroid rudiments, and assists in forming the lobes of the gland. Originally the duct extends as far upwards (forwards in the embryo) as the dorsum of the tongue, but as the body of the hyoid bone develops, the duct becomes divided into an upper segment, the lingual duct, and a lower portion, the thyroid duct. In the ordinary course of development these ducts disappear, but in some cases they persist and attain a fair size, and in others give rise to pathological conditions of great interest.

There are at least three abnormalities which appear to be associated with vagaries of the thyro-glossal duct, viz. (1) lingual dermoids, (2) median cervical fistulæ, (3) accessory thyroids. It will be convenient to begin with dermoids in the tongue.

Lingual Dermoids have been frequently mistaken for sebaceous cysts, and until recently were regarded by most surgical writers as rarities. Since Barker* published his excellent paper on the subject, many cases have been observed and recorded. Barker analysed sixteen cases, and showed that

* Trans. Clin. Soc., vol. xvi., p. 215.

they may be situated between the genio-hyo-glossus and mylo-hyoid muscles, or occupy a central position between the genio-hyo-glossi muscles.

The lateral group is discussed in the section devoted to dermoids arising in branchial clefts; those occupying the centre of the tongue concern us now.

Central dermoids of the tongue are rarely sufficiently large to attract attention in infants. Richet, however, removed one from a child, a few days old, in l'Hôpital St. Louis. Most of the cases have occurred in young adults, and in many instances have been regarded as ranulæ. As a rule, they cause the floor of the mouth to bulge on each side of the frænum, and when unusually large, a prominence is noticed under the chin. In at least two cases the swelling has been mistaken for an abscess. The dermoid can be removed, when small, through the floor of the mouth, and when large by dissection through a median incision extending from the chin to the body of the hyoid. The cyst-wall must be completely dissected out. A man, aged twenty-four years, came under my care with a lingual dermoid that had been previously mistaken for a ranula; during nine years he had been submitted to seven operations without success. On dissecting out the cyst I found it firmly adherent to the body of the hyoid bone, and extending between the genio-hyo-glossi to the foramen cæcum.

The walls of lingual dermoids are composed of fibrous tissue, lined internally with squamous epithelium beset with hair, and sometimes glands. In one case reported by Stephen Paget* there was a deposit of pigment in the cyst-wall. The contents of these cysts are epithelial cells, hair, sebum, and cholesterine. Should the cyst burst, then it would suppurate and become very disagreeable.

Dermoids lying in the middle line of the tongue arise in the lingual duct. This, when fully developed, extends from the foramen cæcum to the posterior surface of the body of the hyoid: the foramen cæcum marks the termination of this duct on the dorsum of the tongue; occasionally it is so large that a narrow probe may be passed along it.

* Trans. Path. Soc., vol. xxxvii., p. 225.

The duct lies exactly between the genio-hyo-glossi muscles, and is not infrequently replaced by a solid fibrous cord. It is easy to understand that if a persistent duct should have its upper end obstructed or obliterated, the continual shedding of the epithelium which lines it and the accumulation of

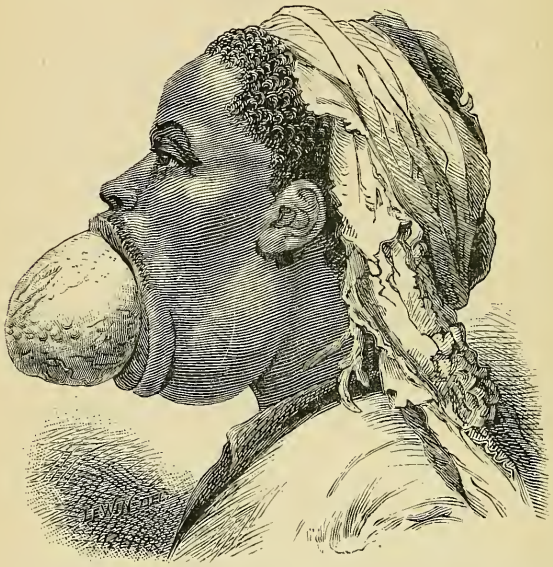

Fig. 147.—Large lingual dermoid, protruding from the mouth. (*Gray.*)

sebum from the glands would convert it into a cyst, which in due course would assume such a size as to come within the range of clinical observation. Such a tumour would project into the floor of the mouth and, when unusually large, form a swelling above the body of the hyoid bone. In some rare instances they project from the mouth, as in the negro whose case was reported by Barker.* This man was under the care of Dr. Wellington Gray, in Bombay. (Fig. 147.)

The tumour protruded from the man's mouth, and was as large as a medium-sized cocoa-nut. It completely filled the space between the jaws, the upper incisor teeth projected horizontally forwards, whilst those of the lower jaw were not only loosened, but their direction was reversed. The tumour

* Trans. Clin. Soc., vol. xxiv., p. 68.

caused a swelling in the neck as low as the thyroid cartilage. The patient's voice was an indistinct mumble, and only fluid food could be taken. The tumour was successfully removed: it contained forty ounces of pultaceous matter, consisting of epithelium, fat, and cholesterine. The walls were lined with epithelium. Such large cysts are excessively rare. Stephen Paget* described a very large cyst which he successfully removed from a child four years old, in whom it was congenital. Its anatomical relations were like those of a dermoid arising in the lingual duct. It contained fluid of a yellow colour, and was so large as to project from the child's mouth and almost touch the sternum.

In addition to the common variety of dermoid, the tongue is occasionally occupied by tumours which in structure resemble the thyroid gland. They occur in the neighbourhood of the foramen cæcum, between the genio-hyo-glossi muscles. Bernays has given a careful description of such a tumour, which he removed from the tongue of a girl seventeen years of age. In the account of the case Bernays† clearly associates the tumour with the lingual duct.

Butlin‡ has recorded two cases that came under his notice: one in a female thirty-two years of age, and the other—also a female—twenty-seven years old. The tumours were situated at the base of the tongue, where they formed prominent swellings just in front of the epiglottis, and caused very little inconvenience.

A curious effect of the partial removal of these tumours is noted by Butlin. The interference excited growth and for a time caused the remnants to increase in size; gradually growth ceased, the tumour remained passive, and then dwindled to half its bulk. This happened in the two cases under Butlin's care and in a case recorded by Rushton Parker.

Wolf§ has described an example which occurred in a girl of eighteen years. He removed the tumour from the substance of the base of the tongue. As its microscopical characters

* Trans. Path. Soc., vol. xliii. 57.

† *St. Louis Medical and Surgical Journal*, vol. lv. 201.

‡ Trans. Clin. Soc., vol. xxiii. 118.

§ Langenbeck's "Archiv," bd. xxxix. 224. *See also* Warren, *International Journal of Med. Science*, October, 1892, vol. civ. p. 377.

so strongly resembled thyroid gland, Wolf regarded it as an accessory thyroid body (*accessorishe schilddruse*).

We have now to deal with abnormalities arising in connection with the thyroid section of the thyro-lingual duct. It will be convenient to begin with the consideration of **median cervical fistulæ.** These openings occur singly, and open at some point in the middle line of the neck between the hyoid bone and the top of the sternum. The common situation is a little below the level of the cricoid cartilage. Median cervical fistulæ differ from those arising in connection with branchial clefts in the fact that they are never congenital; they may occur soon after birth or make their appearance as late as the fourteenth year.

Raymond Johnson* has clearly pointed out that median cervical fistulæ are often preceded by a swelling in the middle line of the neck which either ruptures or is opened by the surgeon; this leaves a sinus which never closes. Johnson illustrates these facts by careful descriptions of three cases that he observed.

In some cases an oval swelling the size of an almond forms in the middle line of the neck, at the level of the thyroid isthmus; from this a rounded cord may sometimes be felt passing upwards to the hyoid bone.

The fistulæ easily admit an ordinary probe, which always passes upwards to the body of the hyoid. Hence when the surgeon attempts to dissect out these sinuses he finds that they run upwards between the sterno-hyoid muscles and beneath the deep fascia of the neck to reach the hyoid bone. Few of these fistulæ have been examined microscopically, but in one of Johnson's cases the cord dissected out was 4 cm. in length, equal in calibre to a No. 6 English catheter, and composed of concentric layers of fibrous tissues. The inner surface was covered with stratified epithelium. Unless the whole length of the duct is extirpated, the sinus will persist.

The fact that these median cervical fistulæ are preceded by a swelling is a fact of great interest. Cusset† described the case of a little girl five years old, in the middle line of whose neck there was a swelling below the hyoid bone; this opened

* Trans. Path. Soc., vol. xli. 325.

† "Kystes et Fistules d'origine branchiale." Paris, 1877.

and discharged a glairy fluid and left a sinus that passed upwards to the base of the tongue; but Johnson seems to be the first to emphasise the fact that *a swelling in the neck precedes the sinus.*

Our knowledge of the nature of these fistulæ was not very satisfactory until the publication of an able paper by Dr. C. F. Marshall,* detailing an account of the anatomy of the parts in the neighbourhood of the hyoid bone of a child five years old, who had a median sinus in the neck.

The patient was admitted into a hospital for the purpose of having the duct excised; it contracted diphtheria and died before the operation could be performed.

In the median line of the neck, 2·5 cm. (1″) above the sternum, there was a sinus which, during life, discharged a small quantity of mucous fluid. From this opening a hard cord could be felt extending up to the hyoid bone. On dissecting the front of the neck this cord was found to be tubular and patent up to within 1 cm. of its termination: the upper end was firmly attached to the hyoid bone, the lower end dilated into a thin-walled sac opening on to the surface of the skin. The sac and tube lay between the skin and the anterior layer of the deep cervical fascia: at no place was there any connection with the thyroid gland.

On dividing the hyoid bone the tube could be traced as an ill-defined fibrous cord on to its dorsal surface, to which it was closely attached, and through the substance of the tongue to the foramen cæcum. About 2 cm. from the foramen it again became patent, and continued so up to the surface of the tongue. The canal was thus open at both ends, but impervious in the middle.

On further dissection a lobus pyramidalis was found connected with the left side of the thyroid isthmus, its upper end being united to the median fibrous cord at the same place as the above-mentioned canal. In other words, the fibrous cord behind the hyoid bone was continuous both with the pyramidal lobe of the thyroid and with the tube leading to the superficial sinus.

The relations of the parts are admirably shown in Fig. 148, which indicate exceedingly well the probable mode by which

* *Journal of Anat. and Phys.*, vol. xxvi., p. 94.

these median fistulæ arise, for a glance at the diagram is sufficient to suggest that they are in the first place retention cysts formed in a persistent thyroid duct, and the pressure of the cyst ultimately causes the skin to yield and form a sinus.

Marshall is of opinion that the canal is the remnant of one of the bifurcations of the original median thyroid rudiment, the remaining bifurcation forming the pyramidal lobe of the thyroid body. At present there is little to support Kostanecki and Mielęcki's* contention that median cervical fistulæ arise in connection with the "precervical sinus."

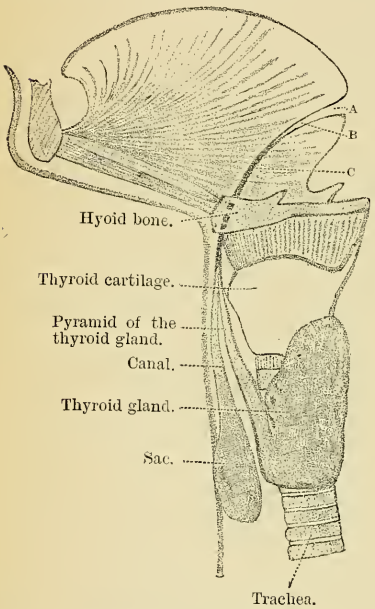

Fig. 148.—Diagram to show the relation of parts in a case of median cervical fistula. (*After C. F. Marshall.*) A, foramen cæcum; B, C, lingual duct.

Accessory Thyroids.—The consideration of accessory thyroids naturally follows on the description of median cervical fistulæ, for there is good reason to believe that the thyroid duct is the source of some of these bodies. The existence of accessory thyroids has long been known,† and in recent years they have been carefully studied. It will be convenient to consider them according to their situation:—(1) Median accessory thyroids; (2) lateral accessory thyroids.

1. **Median Accessory Thyroids.**—The most frequent situation in which to find these small bodies is in the neighbourhood of the hyoid bone, and Streckeisen, who has published the results of a careful inquiry into this question, divides them into four groups:—(1) Those superficial to the mylohyoid muscle—*pre-hyoid.* (2) Between or in the substance of the genio-hyoids—*supra-hyoid.* (3) Above the

* Virchow's "Archiv," bd. cxx. 385 and cxxi. 55.

† Albers' "Atlas der Path. Anat.," Abth. ii., Taf. xxv., xxvi., and xxxix.; also Virchow, "Die Krankhaften Geschwülste," bd. iii. s. 13.

genio-hyoid—*epi-hyoid*. (4) They may be lodged in the hollow or even in the substance of the hyoid bone—*intra-hyoid*. Another common place in which to find them is in the hollow formed by the two lobes of the thyroid.

It has already been pointed out that the lingual duct is, in the early embryo, directly continuous with the thyroid duct, and that the continuity of the two is interrupted by the development of the body of the hyoid. It was also stated that the terminal portion of the thyroid duct bifurcates and gives rise to the isthmus of the thyroid and adjacent portion of each lateral lobe.

Usually all traces of the duct disappear, but in a fair portion of cases it forms a pyramidal process for the thyroid, and not infrequently it persists as a duct running from the hyoid bone to the thyroid isthmus, and contains a lumen capable of admitting an ordinary probe: in some instances it is an impervious cord, and occasionally it is moniliform.

As the duct is directly associated with the formation of the thyroid body, and as median accessory thyroids are found directly in its track from the hyoid to the thyroid isthmus, it is not unreasonable to regard these little bodies as remnants of this remarkable tube.

2. **Lateral Accessory Thyroids.**—The thyro-glossal duct is not responsible for all accessory thyroids, for they occasionally arise in connection with the germs of the lateral lobes of the thyroid. This variety is most commonly found in the neighbourhood of the greater cornua of the hyoid.

Accessory thyroids are in the main innocent structures, but occasionally they give rise to troublesome tumours. It is well known that when the thyroid body becomes goitrous, and accessory thyroids co-exist, the latter will enlarge and become in fact, goitrous. Apart from this, accessory thyroids will enlarge on their own account and give rise to tumours that closely simulate unilateral enlargement of the thyroid, and occasionally give rise to bronchoceles of moderate dimensions.

Pollard* has carefully described a tumour removed by Barker from the anterior triangle of the neck of a man aged

* Trans. Path. Soc., vol. xxxvii. 507.

thirty-five years: the tumour was cystic, and from its inner wall numerous villous processes, covered with a single layer of cubical epithelium, projected into the cavity.

The Infundibulum and Pituitary Body.—The close structural relationship of the glandular portion of the pituitary body to the thyroid gland makes it desirable to describe tumours of this structure in sequence with those connected with the thyro-glossal duct. The infundibulum arises as a diverticulum from the first encephalic vesicle, and ends blindly in the substance of the pituitary body. This body also comes into relationship with a diverticulum from the developing pharynx known as the pouch of Rathké. Although the pouch and the infundibulum come into close relationship with the pituitary body, they do not communicate with each other. Dermoids, adenomata, and cysts are met with in connection with these structures:—

1. **Dermoids.**—Bowlby* described a tumour as large as a walnut of the pituitary body, composed of vascular connective tissue, spaces lined with epithelium and bone, in a man twenty-two years old. Hale White† met with one the size of a nut; it contained besides connective tissue, vessels, fat cells, nerve fibres, ganglionic cells, and striped muscle fibres. The patient was a boy twelve years old.

2. **Adenomata.**—These resemble in structure the thyroid gland, and bear much the same relation to the pituitary body that parenchymatous goitres do to the thyroid body; indeed, they are sometimes referred to as pituitary goitres. A few cases have been observed in man.‡ Goodhart§ described an interesting case in a baboon, with its clinical history; and Sibley‖ observed a specimen in an ewe.

These tumours are at first isolated from the general cavity of the cranium by the circular fold of the dura mater known as the *diaphragma sellæ*, and they generally produce erosion of the pituitary fossa. As they increase in size, tumours of

* Trans. Path. Soc., vol. xxxvi. 35.

† Trans. Path. Soc., vol. xxxvi. 37.

‡ Wills, *Brain*, vol. xv. 465; Loeb and Arnold, Virchow's "Archiv," bd. lvii. 172.

§ Trans. Path. Soc., vol. xxxvi., 36.

‖ Trans. Path. Soc., vol. xxxix. 459.

the pituitary body usually implicate the optic chiasma and the third pair of nerves, thus producing visual disturbances. Sometimes the tumour will bulge upwards into the third ventricle.

3. **Cysts.**—When the pouch of Rathké persists it sometimes dilates and forms a cyst in the pharynx near the junction of the posterior wall with the roof. Such cysts have been known to reach the size of a ripe cherry; usually they are very much smaller. Laryngologists sometimes regard them as sources of inconvenience, and attack them with the galvano-cautery. A cyst in this situation as large as a cherry would doubtless impede nasal respiration and cause the breathing at times to be unpleasantly audible.

CHAPTER XXXIV.

TUBULO-DERMOIDS (*continued*).

DERMOIDS OF THE RECTUM.

In order to appreciate the nature of dermoids arising in the immediate neighbourhood of the rectum, it will be necessary to consider a few points connected with the embryology of this portion of the alimentary canal. In the early embryo, the central canal of the spinal cord and the alimentary canal are continuous around the caudal extremity of the notochord. This passage, which brings the developing cord and gut into such intimate union, is known as the neurenteric canal. When the proctodæum invaginates to form part of the cloacal chamber it meets the gut at a point some distance anterior to the spot where the neurenteric canal opens into it; hence there is for a time a segment of intestine extending behind the anus, and termed in consequence the "post-anal gut." Afterwards this post-anal section of the embryonic intestine disappears, leaving merely a trace of its existence in the small structure at the tip of the coccyx known as the coccygeal body. There is good reason to regard the post-anal gut as the source of that variety of congenital sacro-coccygeal tumour which was named by Braune* and several writers who followed him "congenital cystic sarcoma." These tumours will be referred to as **thyroid-dermoids**. In addition it will be necessary to consider dermoids situated between the rectum and the hollow of the sacrum—**post-rectal dermoids**—and certain pedunculated tumours situated within the rectum—**rectal dermoids**.

Thyroid-dermoids in structure resemble the thyroid body, for they are composed of closed vesicles lined with glandular epithelium, and contain glue-like fluid. Many of these tumours are composed of cysts and duct-like passages lined with cubical epithelium, held together by richly cellular connective tissue. In many situations the epithelium is columnar, set upon flatter cubical cells. The cysts are filled

* *Die Doppelbildungen*, 1862.

with ropy mucus, and vary in size from a nutshell to the smallest space visible to the naked eye; many contain intracystic processes. These tumours present such very definite characters that they are sure to attract attention, and their large size makes them very conspicuous. (Figs. 149 and 150.)

Middeldorpf* was the first to associate clearly a congenital sacro-coccygeal tumour with the post-anal gut. His specimen was removed from the neighbourhood of the anus of a girl a year old. The tumour contained connective tissue, mucous membrane with characteristic follicles, submucous tissue, longitudinal and circular layers of muscle fibres. I had come to the same conclusion in regard to the probable origin of these tumours before the publication of Middeldorpf's paper; his case is the most conclusive on record. Alexander Mackay,† in a pamphlet, gives accounts of two cases in which he successfully removed two of these tumours from female infants aged two and a half, and three months respectively, at Huelva.

Fig. 149.—Thyroid-dermoid. (*Hutchinson.*)

Post-rectal dermoids are very rare, and do not form such large projecting masses as the preceding species. In many instances they are not noticed until after infant life, and their clinical tendencies are of a different character. It is also somewhat remarkable that dermoids, although they are met

* Virchow's "Archiv," bd. 101, s. 37.

† "Surgery in Spain," 1889.

with in many parts of the body, contain teeth only in certain situations; the post-rectal region comes into this category.

The museum of the Middlesex Hospital contains an example of post-rectal dermoid which contains hair and teeth; the specimen is without history, and it probably occurred as a post-mortem surprise.

Such tumours sometimes occur as surgical surprises. Thus a lad aged nineteen years was under Bryant's care for a discharging sinus on the ventral aspect of the coccyx, which had existed since he was three years old. When this was explored a tumour was found between the rectum and coccyx. When removed it was as large as an orange, and consisted of loculi filled with pultaceous material, and contained a piece of bone. The cysts were lined with columnar epithelium.

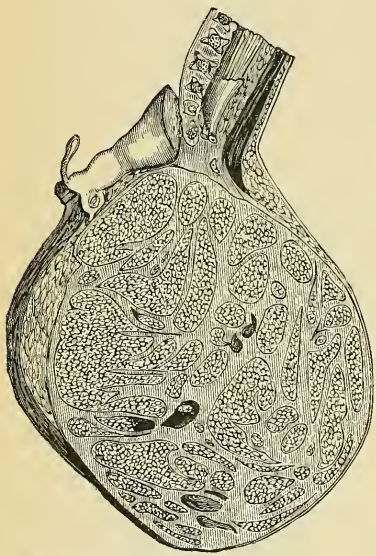

Fig. 150.—Thyroid-dermoid of the coccygeal region, in section. (*After Shattock.*)

Post-rectal dermoids sometimes attain very large dimensions, and extend upwards behind the pelvic peritoneum in men and women.

Ord* described a case in which a dermoid weighing fourteen and a half pounds was found in the pelvis of a man twenty-eight years of age. The tumour contained pultaceous material mixed with hairs. The inner wall of the cyst was lined with piliferous skin; it contained sebaceous glands.

Frederick Page† has described a case in which he removed, through an incision across the space between the anus and coccyx, a large post-rectal dermoid which occupied the hollow of the sacrum in a woman forty-seven years of age. The tumour lay behind the rectum and peritoneum. On opening

* Med.-Chir. Trans., vol. lxiii., p. 1.

† *Brit. Med. Journal*, 1891, vol. i., p. 406.

the cyst putty-like material mixed with hair was removed by means of a spoon; the cyst was then enucleated. The cyst and contents weighed three pounds. When dried and stuffed it assumed an ovoid form measuring 76 cm. in circumference in one direction, and 44 cm. in the other. The patient recovered.

Rectal Dermoids.—Several examples of dermoid tumours have been described growing from the mucous membrane of the rectum: a curious feature in these cases is that the tumours are furnished with long locks of hair, which protrude from the anus and annoy the patients. Like post-rectal dermoids, they sometimes contain teeth.

The case described by Port* may be selected as a typical specimen. (Fig. 151.) The tumour was removed from the rectum of a girl sixteen years of age. It measured 5 cm. in the long and about 4 cm. in its short axis. It was covered with skin furnished with hair and glands: it also presented a tooth. The bulk of the tumour was made up of fat and fibrous tissue. Danzel † observed a similar tumour in a woman twenty-five years of age. It was as large as an apple, and was said to contain brain substance enclosed in a bony capsule; a tooth projected from it. (Fig. 152.) This woman was troubled with long hairs which protruded at the anus and she used to pull them out with her hands.

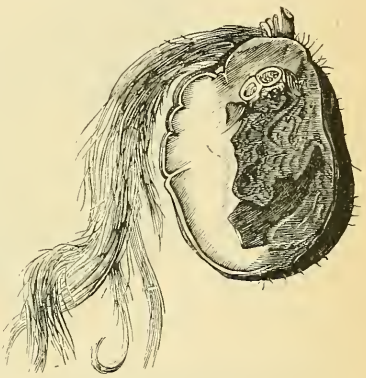

Fig. 151.—Rectal dermoid in section. (*After Port.*)

Clutton‡ exhibited a specimen at the Pathological Society which, in conjunction with Floyer, he had removed from the rectum of a girl nine years of age. The patient had on two occasions been troubled with tufts of hair projecting from the anus. Two of these tufts measured 25 cm. The tumour, after removal, measured about 7 cm. in its longest

* Trans. Path. Soc., vol. xxxi., p. 307.
† Langenbeck's "Archiv," bd. xvii., s. 442.
‡ Trans. Path. Soc., vol. xxxvii. 252.

diameter. In its general characters it resembled the two specimens figured (Figs. 151 and 152). It appears to have been attached, however, at a higher point in the rectum.

The student should compare rectal with pharyngeal dermoids: it is somewhat curious that pedunculated dermoids

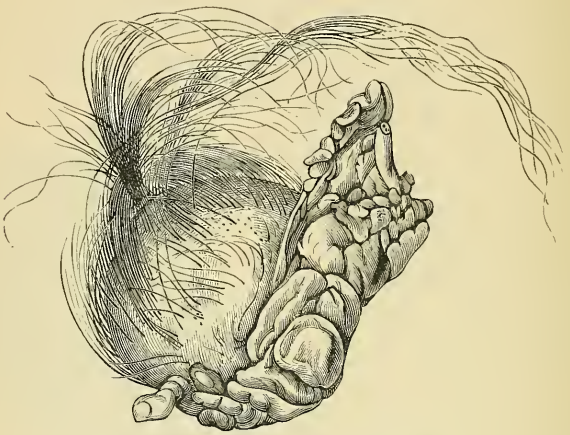

Fig. 152.—Rectal dermoid. (*After Danzel.*)

should be peculiar to the two extremities of the alimentary canal. It was formerly suggested that rectal dermoids of this character originated in the ovary, and afterwards invaginated the rectum, finally presenting themselves at the anus. No one can, with our present knowledge, seriously advocate this theory. Pedunculated dermoids growing from the wall of the rectum must not be confounded with those ovarian dermoids which erode the wall of the rectum, then suppurate and discharge their contents into it.

CHAPTER XXXV.

TUBULO-DERMOIDS (*concluded*).

BRANCHIAL FISTULÆ AND CYSTS.

Since 1875, when Rathké found evidence in the embryos of pigs, horses, and chicks, of the branchial clefts so characteristic of fish, many eminent anatomists have confirmed his observations. Rathké was also fortunate enough to detect the fissures in an early human embryo. (Fig. 153.)

It appears that in 1789 Hunczowski* described two cases of congenital fistulous openings in the side of the neck. In 1829, Dzondi described similar openings under the name of tracheal fistulæ: and Ascherson, three years later, showed that such fistulæ communicated with the pharynx and not with the trachea.

Fig. 153.—Early mammalian embryo, showing the gill-clefts.

Heusinger,† in 1864, collected a number of recorded cases, and was the first clearly to associate these congenital cervical openings with the branchial clefts detected by Rathké. It has been asserted by His, and in this he has been followed by other writers, that the supposed clefts are merely furrows between the arches; the furrows being visible on the inner as well as on the outer surface, but they are separated from each other by membrane. This view, as will be shown afterwards, is not in harmony with facts.

The human embryo has four branchial clefts. Of these, the first becomes the tympano-Eustachian passage, and the three posterior clefts usually suffer obliteration. Frequently, one or more of the clefts persist wholly or in part, and are then known as "congenital cervical fistulæ." These fistulæ appear as fine canals, capable of admitting a bristle, and some a fine probe. The orifice usually opens in the neck; but when complete into the pharynx also. There is reason to believe that they may open into the pharynx, but end externally as a

* Fischer, "Deutsche Zeitsch. für Chir.," bd. ii.

† Virchow's "Archiv," bd. xxix., 358.

cul-de-sac. One, two, or three fistulæ may be present in the same individual; they have a great tendency to be bilateral, to affect several members of the same family, and to be transmitted to several generations. The canals, which may vary in length from 2 to 5 cm., are lined by mucous membrane, sometimes with ciliated epithelium, or by skin containing

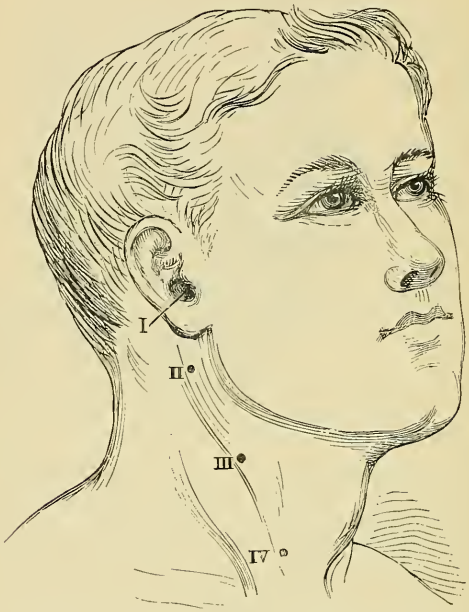

Fig. 154.—Diagram to indicate the orifices of persistent branchial fistulæ.

sebaceous glands. The lining membrane of the canal usually secretes a thin mucous fluid, which may become increased during catarrhal conditions of the respiratory passages. Occasionally the canal inflames and an abscess results, which may give rise to considerable pain and difficulty in deglutition. The external orifice of a branchial fistula may be indicated by a tag of skin, containing a piece of yellow elastic cartilage. These cutaneous processes, or cervical auricles, as they are called, are of sufficient interest to require separate consideration (page 330).

Neglecting for the present the first cleft—the tympano-Eustachian passage—it may be convenient to consider the

situations usually occupied by these fistulæ when they occur in man.

The **external orifices** of the fistulæ are apt to vary, but they usually open in the positions shown in Fig. 154. The first becomes the tympano-Eustachian passage; the second opens close behind the angle of the jaw anterior to the line of the sterno-mastoid muscle; in a few cases it may be on a level with, and slightly posterior to, the lobule of the pinna. The third is situated on a level with the thyro-hyoid space close to the anterior border of the sterno-mastoid: this position is very constant. The fourth usually opens near the sterno-clavicular articulation; it may open 3 or 4 cm. higher in the neck, but always in relation with the anterior border of the sterno-mastoid muscle.

The **internal orifices** of these fistulæ may be indicated in the following way. The second opens into the recess containing the tonsil; the third and fourth are in relation with the sinus pyriformis. To reach this sinus, a fistula corresponding to the third cleft must pass over the loop formed by the superior laryngeal nerve. Hueter's* observation is interesting in this connection: "In a young fellow who wished to become a trumpeter I dissected out one of these fistulous tracks, following it between the two carotids to the pharyngeal cavity."

Prof. His is of opinion that when these fistulæ communicate with the pharynx, it is the result of incautious sounding. I have satisfied myself that these fistulæ do open into the pharynx in cases where no probe has been passed. This I have demonstrated by allowing a child with a second cleft persistent to swallow milk; drops of milk found their way through the fistula and appeared on the skin of the neck.

Abnormal persistence of branchial clefts occurs in four forms:—

1. Complete fistula.
2. The external half persists.
3. The internal half persists.
4. The external and internal orifices are obliterated but an intermediate section persists.

* "Grundriss der Chirurgie," vol. ii., 328, 1st edition.

The first form, complete fistulæ, as far as my own observations extend, occurs most frequently in connection with the second cleft. In one case, a youth aged fifteen years, the communication with the pharynx was so complete that when he swallowed milk some of the fluid occasionally passed through the fistula and appeared at the cutaneous orifice. In another case, that of a little girl aged ten, saliva issued at the cervical orifice when the child had been talking freely, and excited the parotid gland.

The second set of cases, those with external openings, but blind internally, are the most common examples, and need no further comment.

The third class are rarely recognised; this is not remarkable when we remember that they open into the pharynx, but end externally as *cul-de-sacs*. Heusinger was of opinion that some pharyngeal diverticula are of this nature, and Sir James Paget refers to the probability that some rare instances of diverticula from the pharynx may be regarded as dilatations of portions of branchial fistulæ, closed externally, but remaining open within. The most remarkable case of this nature that has been placed on record is the specimen that occurred in the body of an adult male dissected in the University of Edinburgh, and described by Morrison Watson * (Fig. 155).

A tube, terminating inferiorly in a *cul-de-sac* containing a large quantity of grumous material, was found extending from the pharynx, immediately behind the tonsils, to the interclavicular notch. This tube possessed muscular walls, and in the deep part of its course passed between the fork of the carotids and over the loop of the superior laryngeal nerve; its lower part was parallel with the anterior border of the sterno-mastoid muscle; it rested on the sterno-hyoid and sterno-thyroid muscles. It communicated with the pharynx by means of a slit-like opening, not more than 3 mm. in length, the margins of which were so closely in contact that the entry of solid particles into it from the mouth must have been prevented. The diverticulum itself increased in calibre from above downwards, so that whilst at the upper end a crow-quill could with difficulty be introduced, at the lower a pencil could readily be passed along the lumen of the tube.

* *Journal of Anatomy and Physiology*, vol. ix., p. 134.

It is further noteworthy that the pharyngeal orifice was situated between the lower jaw and the stylo-hyoid ligament. Its point of departure from the pharynx corresponds to the supratonsillar fossa. The muscle fibres were, for the most

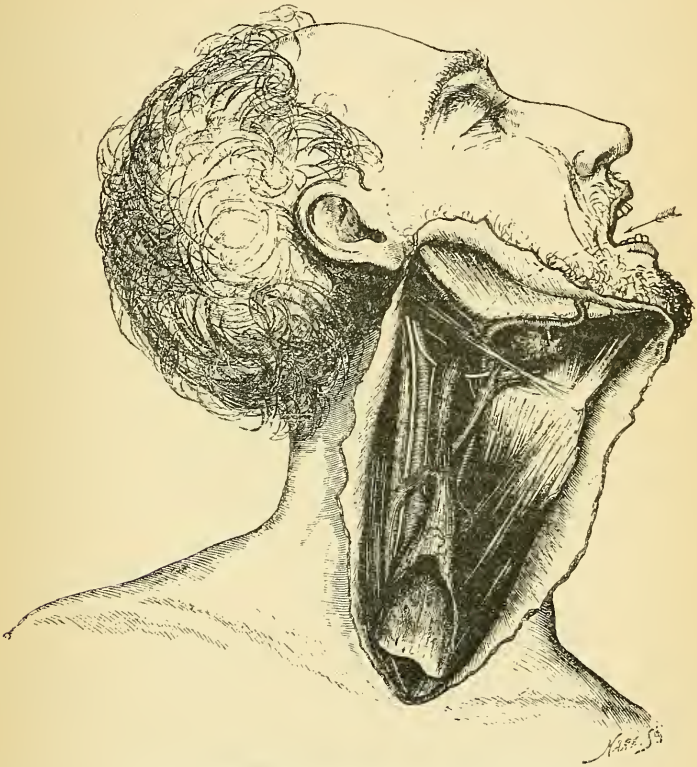

Fig. 155.—Pharyngeal diverticulum. (*After Morrison Watson.*)

part, red and striated, and the mucous lining resembled that of the œsophagus.

The fourth class, those closed at each end, leaving a portion of unobliterated canal in the neck, cannot be recognised except by the effects to which they give rise.

It has long been suspected that the so-called sebaceous cysts which occasionally occur in the neck, below the deep cervical fascia, take origin in unobliterated branchial spaces,

and are dermoids. A convincing case of this kind is described by Virchow.* A woman aged twenty-four had noticed, since the age of fourteen, a tumour between the angle of the jaw and the mastoid process. When she came under observation it was of the size of a goose's egg, there was also a small tumour immediately above the sternum, which she would not allow to be removed. The larger tumour was extirpated, and found to contain sebaceous matter and

Fig. 156.—Head and neck of a young woman, showing branchial fistulæ in the neck, *a*; and a sinus in the helix, A; for *b*, *see* text. (*After Heusinger.*)

epidermal scales. The wall of the cyst was covered with epidermis, and sebaceous glands were disseminated in it.

Lingual dermoids lying between the mylo-hyoid and genio-hyo-glossi muscles most probably arise in a partially obliterated second branchial cleft.

A retention cyst, arising in a partially obliterated branchial cleft, need not necessarily contain sebaceous matter, it may be filled with mucus. This apparent contradiction is capable of easy explanation. The internal segment of a branchial fistula is lined by mucous membrane continuous with that of the pharynx, whilst its external segment is a continuation of the surface epithelium of the neck. It is on this

* "Archiv," bd. xxxv. 208, 1866.

account that some branchial fistulæ possess ciliated epithelium, others squamous, and so forth. If a cystic dilatation arise in connection with the inner segment, a cavity with mucous contents would be the result, whilst in a similar cyst arising from the external segment epidermal scales, sebaceous matter, and cholesterine would be expected. As far as my own observations go, mucous cysts originating in this manner attain larger dimensions than the dermoid varieties. Cervical cysts arise in other ways, and the chapter on hydrocele of the neck should be studied in relation with this subject.

In the copy of Heusinger's sketch (Fig. 156) we find a clear space indicated by the letter *b*, which is thus described in the original: "Immediately above the opening is a slight elevation of normal-coloured skin." In Knox's translation of Dzondi's paper the translator remarks that in many persons, in the region where fistulæ have been observed, he had noticed one or more discoloured spots, which spots are either rounded and of a pale red colour, or brownish, or like subtile striæ of hairs, superior in whiteness to the surrounding skin, but conspicuous only to very sharp sights. I have occasionally found these spots referred to by Knox in persons with branchial fistulæ; they are not infrequent near the angle of the jaw, and correspond to the external orifice of the second cleft.

Examples of persistent branchial clefts have been observed in horses and sheep. Heusinger* has described examples in horses; they open immediately below the pinna, and are noticed more frequently in carriage than in draught horses, as the secretion from the fistula soils the surrounding skin and attracts the attention of the grooms. An example of such a fistula in a sheep is illustrated in Fig. 172 (page 349), and corresponds in position to a persistent second branchial cleft in the horse.

* "Deutsche Zeitschrift für Thiermedicin," bd. ii. 1, 1876.

CHAPTER XXXVI.

DERMOIDS.

CERVICAL AURICLES.

In describing branchial fistulæ in the preceding section it was mentioned that the cutaneous orifices are in some cases surmounted by tags of skin. These tags, or processes, sometimes

Fig. 157.—Cervical auricles in a child.

occur unassociated with fistulæ, but always in situations where fistulæ, when present, open on the skin. Usually they are short, in some cases mere nodules, but in others form prominences 2 to 3 cm. in height. These processes have been described under a variety of names, and classed among tumours, but at the present time they are commonly known as **cervical auricles.**

Like branchial fistulæ, they are always congenital, and sometimes affect several members of a family. The mother may have a cervical auricle, and one of her children a branchial fistula, whilst another child may have an auricle

associated with a fistula; they are often symmetrical. (Fig. 157.) A cervical auricle consists of an axis of yellow elastic cartilage which sometimes extends deeply into the tissues of the neck; muscle-fibres from the platysma are attached to the cartilage, and the whole is surmounted with skin containing hairs and sebaceous glands. A small arterial

Fig. 158.—Head and neck of a goat with cervical auricles.

twig runs into the auricle and ramifies in the fibrous tissue and fat in which the cartilage is embedded.

Thus, structurally, cervical auricles are identical with the normal auricle or pinna, and they agree with the pinna morphologically, inasmuch as they are developed like it from that portion of a branchial bar which is directly in relation with the corresponding cleft.

In sharks the gill-slits open separately on the surface of the body; from the branchial bar, anterior to each slit, a fold of skin is formed which closes upon the slit like a lid, and is named from this resemblance the operculum. In mammalian embryos a slight prominence or tubercle is for a time visible anterior to each of these clefts. In most cases the

tubercles disappear from the posterior bars, but those in relation with the anterior cleft enlarge and are joined by accessory tubercles to form the pinna. Thus embryology has taught me to regard the pinna as consisting mainly of an operculum which has become modified for acoustic purposes, for we may regard the tubercles formed in relation with the branchial clefts of man as representatives of the opercula of

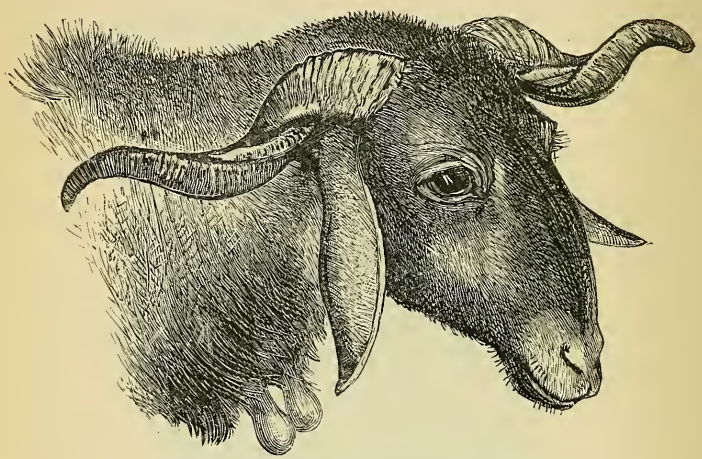

Fig. 159.—Horned sheep with cervical auricles.

certain *Ichthyopsida*. As the pinna is mainly derived from opercular tubercles, and cervical auricles, in all probability, represent persistent opercular tubercles, it is reasonable to term them cervical auricles.

The homology of at least a part of the pinna and cervical auricles with the opercula of fish has been made clearer by Schwalbe's* discovery of auricular tubercles in the embryo of the turtle (*Emys lutaria taurica*); in the adult condition chelonians have no vestige of auricles.

Cervical auricles occur in mammals other than man. Heusinger, in 1876, mentioned the frequency with which pendulous tags of skin occur in the necks of pigs, goats, and sheep, yet very little has been done to extend his observations. As a matter of fact these pendulous bodies are extremely common in the necks of goats.

* "Über Auricularhöcker bei Reptilien." *Anat. Anzeiger*, vi Jahrgang, 1891, Nr. 2.

The anatomy of these auricles in the goat is similar to that of cervical auricles in man: there is an axis of yellow elastic cartilage embedded in fibrous tissue and fat, the whole being covered with hairy skin. In size they are very variable, and in the goat from which the drawing (Fig. 158) was made the auricles were unusually large.

Cervical auricles are occasionally present in sheep, and a

Fig. 160.—Head of a pig with cervical auricles (the Bell-pig of Australia).

good specimen is sketched in Fig. 159. The most remarkable examples of cervical auricles in sheep are those associated with a persistent second branchial fissure. (*See* page 172.)

In Great Britain cervical auricles are rare in pigs, but Professor Anderson Stuart has drawn attention to the existence in Australia of a breed of pigs known as the Bell-pig, on account of the presence in the neck of pendulous folds of skin in the neck. It may here be mentioned that in Germany these auricles in sheep and pigs are known as *glöckchen oder Berlocken*. The sketch of the Bell-pig was obtained from the stuffed head of a pig which Professor Stuart was good enough to bring me from Sydney (Fig. 160). The original I presented to the museum of the Royal College of Surgeons.

Before concluding the subject of cervical auricles reference must be made to the presence of these appendages on the necks of satyrs. My friend Mr. Shattock drew my attention to this matter. In the statues of many satyrs we find in the neck, in the situation where cervical auricles are usually found,

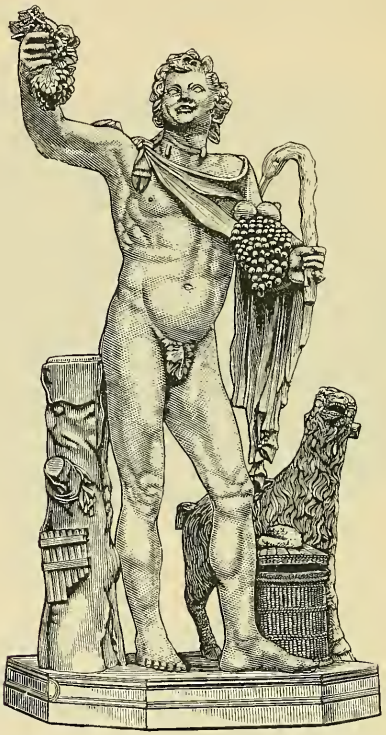

Fig. 161.—Faun and goat with cervical auricles.

prominences which in their variety of form resemble the cervical auricles of goats and men. In the ægipans (goat-footed satyrs) the auricles in the neck are pointed like their ears, and are sessile, but in the fauns they are usually pendulous. In the statues of many satyrs, both fauns and ægipans, no auricles are represented, and they are less constant in modern than in ancient statues of fauns, and in some they are unilateral.

It is an interesting subject for speculation whether the sculptors obtained their notion of the cervical auricles from

human models or from goats. The pendulous forms were probably copied from goats. This is well illustrated in the faun from the Capitol (Fig. 161), for we see at his side a goat with unmistakable auricles, and a goat's skin is thrown over the faun's shoulders. The hircine element in the composition of these mythical satyrs is evident in more ways than one. The ægipans are goat-legged, and their tails, as well as those of their fabled sensual relatives, the fauns, are excellent copies of goats' tails.

A study of many satyrs induces me to believe that some

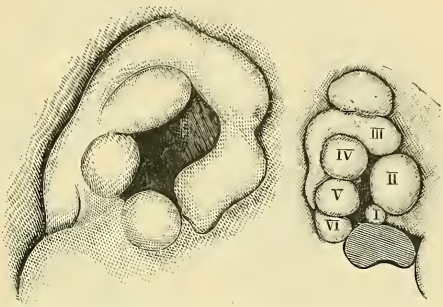

Fig. 162.—Two drawings representing the development of the auricle. (*Modified from His.*)

of the auricles are copies from human models. A good instance of this is a marble head in the Glyptothek at Munich, described as "The head of a laughing faun." In this specimen the auricle is unilateral and identical in shape with those in the necks of children.

AURICULAR DERMOIDS AND FISTULÆ.

We may assume that the auricle or pinna consists mainly of an enormously developed operculum which has become utilised for acoustic purposes. It has already been pointed out that in the embryo, each branchial cleft is surmounted by a swelling or tubercle corresponding to the operculum of the shark. In mammals, and as Schwalbe has shown, in reptiles, the first cleft, which ultimately becomes modified into the tympano-Eustachian passage, is surrounded by additional tubercles, some of which belong to the mandibular and others to the hyoid bar. (Fig. 162.) It is by the subsequent growth and coalescence of these tubercles that the auricle is formed.

These tubercles have received the following names from His*:—I., tuberculum tragicum; II., tuberculum anterius; III., tuberculum intermedium: IV., tuberculum anthelicis; V., tuberculum antitragicum: and VI., lobulus.

The subsequent fate of these tubercles may be briefly given. The tuberculum tragicum unites across the cleft, with the tuberculum antitragicum, the space formerly

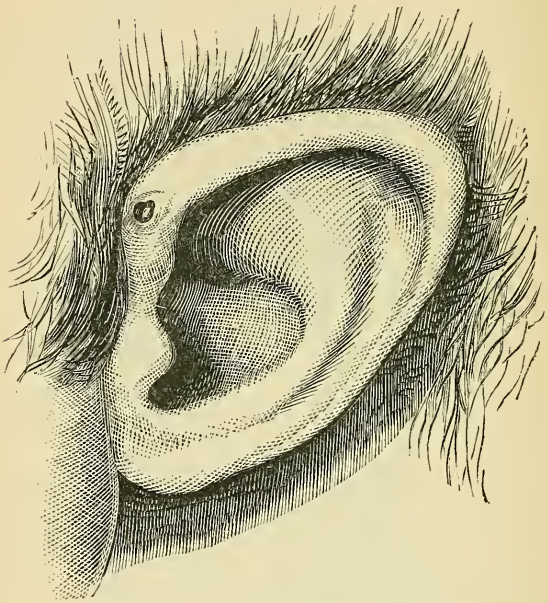

Fig. 163.—Congenital fistula in the helix. (*After Paget.*)

separating them being simply indicated by the incisura intertragica. The tuberculum intermedium is the source of the helix, whilst the tuberculum anthelicis furnishes the anthelix; the nodule VI., cut off by the fusion of tragus and antitragus, becomes the lobule.

Imperfections in the development and union of these tubercles will serve to explain several congenital defects to which the auricle is liable. Of these, three are of especial interest:—(1) Auricular fistulæ; (2) dermoids; (3) accessory tragus.

* *Anat. Men. Embryonen*, 1885, heft. iii.

1. **Auricular Fistulæ.**—Heusinger seems to have been the first to describe a congenital fistula in the helix. (Fig. 156.) For the first complete account of these fistulæ in England we are indebted to Sir James Paget.* The fistula usually appears as a small opening leading into a canal ending blindly in the substance of the helix. The auricle may be of good shape, but often it is deformed. (Fig. 163.) Usually a small quantity of greasy material exudes from the

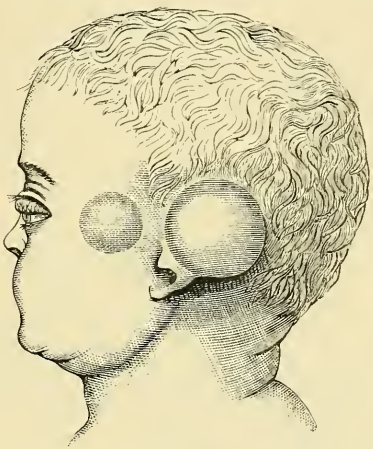

Fig. 164.—Dermoid of the auricle and nævus of the palpebral conjunctiva. (*After Lannelongue.*)

orifice of the sinus, which varies from 2 to 6 mm. in depth These fistulæ sometimes exist in individuals who also have branchial fistulæ; or one member of a family will have a congenital fistula in the auricle, and another a congenital fistula in the neck; they are hereditary.

It is far rarer to find congenital fistulæ in the **lobule.** Very few examples have been observed. A little girl (daughter of a friend) was born with a perforation in the lobule of the left auricle exactly in the spot for wearing an earring, and to this day she wears a ring in this lobule and refuses to have the other pierced.

The facts now at our disposal enable us to understand how such fistulæ arise, for it seems reasonable to conclude that if the various lobules which conspire to form an auricle

* Med.-Chir. Trans., vol. lxi., p. 41, 1878.

unite imperfectly, the intervening spaces would persist as sinuses or fistulæ.

(2) **Auricular Dermoids.** — From what has just been stated regarding the probable mode of origin of auricular fistulæ, it will be obvious that if unobliterated skin-lined spaces are left between the tubercles uniting to form the auricle, and the skin lining such spaces possesses glands (sequestrated tracts of skin are unusually rich in sebaceous glands), we have in such a space a potential dermoid.

The auricle is not an uncommon situation for cysts often described as sebaceous; usually they are small, but sometimes attain the dimensions of a cherry or even larger. When these supposed sebaceous cysts are examined microscopically they sometimes turn out to be dermoids (Fig. 164). It is a curious fact that unless small dermoids in unusual situations are very cautiously examined, they run a great chance of being put aside as sebaceous cysts.

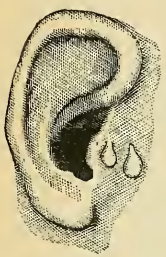

Fig. 165. — Auricle with an accessory tragus.

Auricular dermoids of fair size sometimes occupy the groove between the pinna and the mastoid process; if allowed to grow they will form a deep hollow in the underlying bone.

(3) **Accessory Tragus.**—One of the commonest malformations of the pinna is reduplication of the tragus. The accessory tragus is extremely variable in form; often it assumes the form of a low conical projection in front of or above the tragus (Fig. 165); sometimes it is pedunculated and hangs as a small cutaneous tag slightly in front of the tragus, beset with pale delicate hair.

Occasionally an accessory tragus is associated with a circular cicatrix-like depression in the cheek immediately in front of the pinna. It is a fact of some interest that malformations of the tragus, and the presence of an accessory tragus, are often associated with defects in the mandibular fissure, such as macrostoma, mandibular fistula, and tubercle. This association is shown in Figs. 130, 131 and 179.

CHAPTER XXXVII.

DERMOIDS (*concluded*).

OÖPHORITIC (OVARIAN) CYSTS.*

Ovarian Cysts, formerly included in one genus, comprise four distinct species. Of these, three species, parovarian cysts, paroöphoritic cysts, and ovarian hydroceles, are considered in Group IV. In this chapter we have to deal with those cysts to which the term ovarian strictly applies, and as they arise in the oöphoron, or egg-bearing portion of the ovary, it will avoid confusion to refer to them as oöphoritic cysts. Of these there are three varieties :—

1. Simple oöphoritic cysts.
2. Ovarian adenomata.
3. Ovarian dermoids.

1. **Simple Oöphoritic Cysts.**—These may be unilocular or multilocular. When the cysts are large it is difficult to demonstrate an epithelial lining on the interior of the loculi, but in their early stages they have a membrana granulosa. When they attain the size of a melon stratified epithelium may be sometimes demonstrated. In very large cysts, such for instance, as have a capacity of one or more gallons, the walls consist of fibrous tissue only, the epithelium atrophies from the pressure to which it has been subjected.

2. **Ovarian Adenomata.**—These are always multilocular. They have a fibrous capsule through which the various loculi project and produce a lobulated surface. On section the tumour displays a honeycomb appearance, the loculi of which are of various shapes and sizes ; many do not exceed 1 cm. in diameter, others are as large as melons. These cavities are filled with viscid fluid identical in its physical characters with mucus. The walls of many of the smaller loculi are covered with a regular layer of tall columnar epithelium ; many of them contain in addition complex mucous glands,

* In this work the characters of ovarian cysts are only briefly described, as they are considered very fully in my work on Surgical "Diseases of the Ovaries."

and others are indistinguishable from ovarian follicles. When these tumours are fresh, if some of the smaller loculi are punctured with a knife and the fluid watched as it flows through the opening, a small opaque body about the size of a rape-seed will be detected; it floats on the mucus like the cicatriculum on the yolk of an egg.

3. **Ovarian Dermoids.** — A very large proportion of oöphoritic cysts contains skin and mucous membrane, or

Fig. 166.—Mucous membrane from an ovarian dermoid.

both these structures, and one or many of the appendages peculiar to them. In a unilocular cyst, the skin or mucous membrane may line it throughout, or be restricted to a very small area. In some multilocular cysts one cavity will be lined with skin, whilst others possess mucous membrane; many are filled with glandular tissue, and others have an epithelial lining which will stand for skin or mucous membrane. The skin in an ovarian dermoid may be bald, or it may be richly furnished with cutaneous appendages, such as hair, sebaceous glands, sweat glands, mammæ, nippleless

mammæ, and nipples without mammæ. Teeth sometimes occur in prodigious numbers (300 have been counted); unstriped muscle-fibre, dermal bone, and bone cancellous in texture; horn and nail are occasionally present, and very rarely brain-like tissue. The important fact to bear in mind is that the structures found in dermoids of the ovary are always those normally belonging to skin or mucous membrane. Formed organs, such as limbs, vertebræ, long bones, or cranial bones, do not occur. The imagination of dissectors sometimes leads them to see in these irregular bony masses, maxillæ, mandibles, parietals, etc.: others have found perfect fœtuses, but these were calcified extra-uterine fœtuses (lithopædia). In past times ovarian dermoids have been mistaken for extra-uterine fœtuses, and *vice versâ*. Such errors, now unpardonable, gave colour to the parthenogenetic theory of ovarian dermoids. No one has demonstrated liver, heart, lungs, intestine, kidney, bladder, etc., in an ovarian dermoid.

Oöphoritic cysts, simple, adenomatous, or dermoid, sometimes attain prodigious proportions—fifty, sixty, and one hundred pounds. A cyst with its contents has been known to weigh one hundred and sixty pounds (Cullingworth). Oöphoritic cysts occur at all ages, from the seventh month of fœtal life to the eighty-fourth year. There is no satisfactory record of the dermoid variety having been observed before the end of the first year of life.

Secondary Changes.—Three accidents to which ovarian cysts are liable—viz., axial rotation, rupture, and suppuration—must be considered.

Axial Rotation.—Ovarian cysts, in common with many varieties of pedunculated cysts, are liable to rotate on their axes, a movement which leads to torsion of the pedicle and consequent interference with the circulation of the tumour. When the torsion is acute, severe pain and venous engorgement are the usual effects; when the rotation occurs slowly, it may so completely arrest the venous and arterial current through the pedicle that growth is stopped, and in exceptional cases the cyst slowly atrophies. In a small proportion of cases the life of the tumour is preserved in consequence of adhesions it acquires to surrounding tissues, especially omentum. When this happens the original connections of the cyst

with the uterus are gradually severed, and its nutrition is derived from the omentum in virtue of new vessels formed in the adhesions. When an operation is carried out for the removal of such a tumour the surgeon is surprised to find an

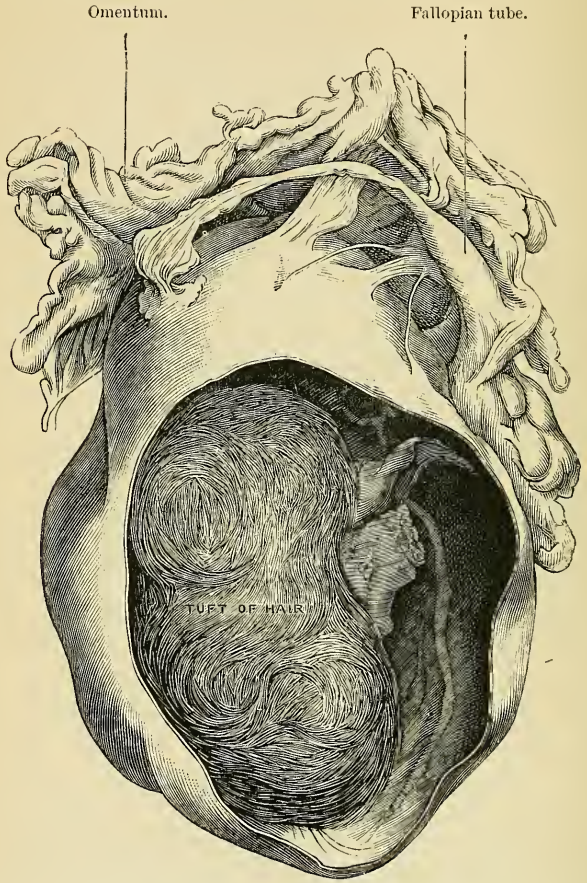

Fig. 167.—Ovarian dermoid detached from the uterus and hanging from the omentum. (*Removed by Sir George Humphry.*)

ovarian dermoid with a Fallopian tube hanging from the omentum, unconnected with the uterus. (Fig. 167.)

Rupture.—When simple ovarian cysts rupture, the bland fluid they contain rarely gives offence to the peritoneum; it is quickly absorbed and excreted by the kidneys. When ovarian dermoids rupture, the richly cellular contents are scattered

over the peritoneum and give rise to grave disturbance. The most interesting event that follows the intraperitoneal rupture of an ovarian dermoid is the appearance of secondary dermoids on the peritoneum. This rare form of epithelial infection may take the form of minute granules on the peritoneum, each of which is furnished with a tuft of delicate lanugo-like hair,* or they may give rise to tumours as large as cherries or even Tangerine oranges. These may hang from the under surface of the liver† or form clusters like "cherries upon a branch,"‡ or be embedded in adhesions between coils of intestine. This mode of dissemination of dermoids is analogous to the epithelial infection of the peritoneum occasionally observed with paroöphoritic cysts.

Suppuration.—When air or intestinal fluids gain access to ovarian dermoids, then suppuration with all its attendant evils is the result. Contamination may also arise from punctures with trocars or aspirating needles. More frequently it is due to entrance of fluids from the intestine, due to adhesion of the bowel to some part of the cyst-wall, with subsequent thinning of the adherent parts until the septum becomes so thin that osmosis of intestinal fluids occurs and fouls the cyst. When suppuration happens, the pus may find an outlet through the rectum, vagina, or bladder. Sometimes a sinus forms in the anterior abdominal wall, and it is not rare in such cases for the pus to point at the umbilicus.

THE NATURE OF THE OVARIAN FOLLICLE AND THE MUTABILITY OF SKIN AND MUCOUS MEMBRANE.

Oöphoritic cysts of the three varieties discussed in the first part of this chapter arise in ovarian follicles. The remainder of this chapter will be devoted to the consideration of the nature of the ovarian follicle and to the relationship of skin and mucous membrane; it will also be necessary to discuss briefly the mutability of epithelium.

The Nature of the Ovarian Follicle.—The phylogeny of the ovarian follicle is intimately bound up with the history of the peritoneum. The pleuro-peritoneal cavity in most verte-

* Kolaczek, Virchow's "Archiv," bd. lxxv. 399.

† Hulke, Trans. Path. Soc., vol. xxiv., 157.

‡ Fraenkel, *Wien. Med. Wochensehrift*, 1883, p. 865.

brates arises as a schizocœle, due to the splitting of the lateral walls of the embryo into splanchno-pleure and somato-pleure. This mode of origin is secondary, for in simpler forms the cœlom (pleuro-peritoneal cavity) is derived from abstrictions of the archenteron. Thus the cœlom is a derivative of the primitive gut, and its surface is covered with epithelium. The cells of the genital ridge, which form ova and line the follicles, are of the same nature as those which give rise to mucous glands in the intestine. Morphologically, an ovarian follicle is a modified mucous gland.

It will be necessary to discuss the relationship of skin and mucous membrane. **Skin** covers the exterior of the body, and possesses in addition to the horny layer a rete mucosum containing pigment. In many animals it furnishes protective structures such as scales, horns, scutes, quills, bristles, feathers, hair, etc., all of which are modifications of the epidermis or its papillary processes. Glands derived from the surface epithelium may furnish mucus, poisonous fluids, and milk. Subject as skin is to external modifying influences (environment), we need not express surprise at the variety of structure and modification exhibited by it. **Mucous membrane** in its most typical form exists in the intestine. It has a single layer of columnar epithelium, which may be ciliated (amphioxus, petromyzon, ammocœtes). The epithelium dips into the underlying tissue to form mucous glands.

Instead of intestinal mucous membrane, let us select a piece from the buccal cavity. Here we find it lined with layers of flattened epithelium surmounting papillæ; some of these papillæ are calcified and form teeth. Many rodents have hairy patches on the buccal aspect of the cheek. In dogs the mucous membrane of the mouth contains pigment; this is occasionally the case with the lingual mucous membrane in man; and the vagina sometimes contains tracts of blue pigment in monkeys. Sebaceous glands are not peculiar to skin; they are large and numerous in the mucous membrane of the nymphæ, and occasionally in the lips. Mucous glands occur in the skin of batrachians, worms, and as slime glands in fish.

In snails, oysters, mussels, etc., the mantle secretes a shell; in reptiles, and such specialised vertebrates as birds, the glands in the mucous membrane of the oviduct perform a

similar function; calcareous formations resembling shells are constantly formed by the glands in the prostate of man.

A single layer of epithelium avails little in the argument, for worms have a single layer of columnar epithelium to their skin. Amphioxus is similarly provided in the gastrula stage, the cells being ciliated. It has been urged that the lining membrane of the mouth is practically skin, inasmuch as it is derived from the epiblast, and it has been said that, to render the argument valid, hair should be found on the mucous membrane lining the stomach or intestine. Such is, in fact the case, in the remarkable bird, the Darter (*Plotus anhinga*); its pyloric orifice is guarded by a tuft of hair.*

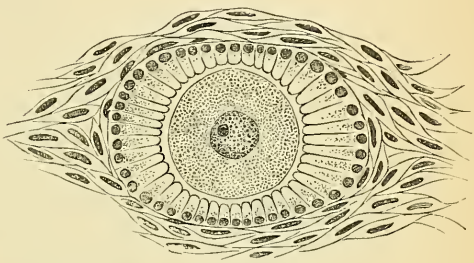

Fig. 168.—Ovum in its follicle: from a cat. (*After Klein.*)

It is well to bear in mind that skin in at least one situation—the conjunctiva—has become modified into mucous membrane and not rarely reverts to its original form. (*See* page 355.)

It used to be taught that epithelium was very stable, but we know that the columnar variety is very mutable. When exposed to external influences and pressure it quickly grows stratified. Examples have been mentioned (page 130). The columnar cells of the intestine become stratified at the margin of a colotomy wound, or on the exposed surface of a pile, and the change from columnar to stratified epithelium occurs normally on the dorsal wall of the cat's trachea, in consequence of the overriding of the extremities of cartilaginous semi-rings under the influence of the trachealis muscle.†

In order to appreciate the high potentiality of the membrana granulosa it should be studied in the cat (Fig. 168), then the student will cease to wonder whence the tall columnar epithelium so characteristic of an ovarian adenoma (Fig. 166) is derived.

* "The Collected Works of Garrod," p. 334.

† Haycraft and Carlier, *Quart. Jour. Micros. Sci.*, vol. xxx., 519, 1890.

CHAPTER XXXVIII.

PECULIARITIES IN THE DISTRIBUTION OF CUTANEOUS APPENDAGES IN DERMOIDS.

In the preceding chapters the various species of dermoids are arranged in their respective genera and their chief clinical features indicated. It will now be useful in bringing this

Fig. 169.—Magnified section of an ovarian dermoid, to show the large size of the sebaceous glands.

section to a conclusion to draw attention to some peculiarities in the distribution of **cutaneous appendages** found in dermoids. The distinguishing feature of dermoids is the presence of skin or mucous membrane, and the structures found in these tumours are those normally associated with skin or mucous membrane.

Hair is the most frequent of the many cutaneous appendages in dermoids and occurs in all the genera. In the case of man it is identical with that which grows on other parts of the body; but its colour is capricious, and usually bears little

relation to that on the body of the individual. In an ovarian dermoid from a negress the hair may be curly, but light-brown in colour. In other animals dermoids contain hair or wool according to the nature of the tegumental covering. It is said that in birds they contain feathers; I have never had

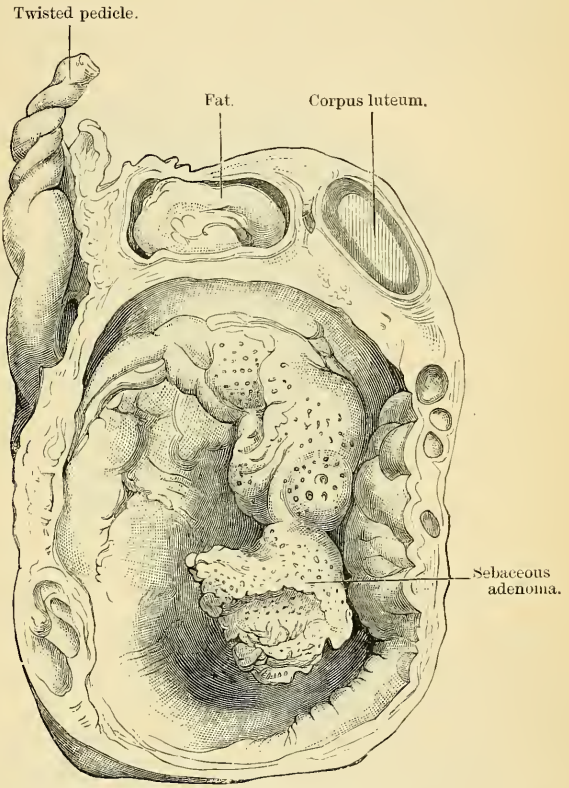

Fig. 170.—Ovarian dermoid with a sebaceous adenoma, from a woman. It contained hair, but its walls were bald.

an opportunity of verifying this statement. Dermoids in pigs contain bristles.

It is a curious fact that hair in sequestration dermoids is rarely longer than 3 cm., whereas in ovarian dermoids it is often 15 or 20 cm. long, and a specimen 1·50 m. (5 ft.) long has been described by Mundé.* The hair on rectal dermoids is sometimes very long. In all genera the hair may become

* *Am. Journal of Obstet.*, vol. xxiv. 854.

white with age, and in elderly individuals a hairy dermoid, like the scalp, may become bald. (Fig. 170.)

The number and size of the **sebaceous glands** in dermoids are very variable. They are numerous and well formed in almost all sequestration dermoids, but attain their greatest size in ovarian dermoids, where they occasionally form a pedunculated tumour—a sebaceous adenoma. (Fig. 170.) The highest variety of secreting gland found in these tumours is

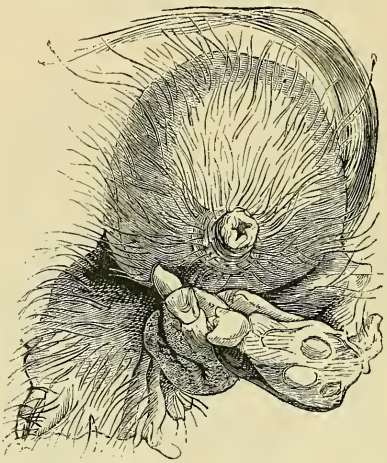

Fig. 171.—Ovarian mamma; hair and teeth are also present. (*Museum, Middlesex Hospital.*)

a **mamma**. Ovarian dermoids sometimes contain nipple-like processes of skin which may or may not be associated with a skin-covered mass of fat, shaped like a mamma; exceptionally these nipples are traversed by ducts associated with glandular tissue which secretes colostrum. (Fig. 171.) A few gland-containing colostrum-secreting mammæ are nippleless. Mammæ and pseudo-mammæ are peculiar to the ovarian genus of dermoids.

The distribution of **teeth** among dermoids is somewhat curious. So far as my observations go they are not found in the sequestration genus, but are of fairly frequent occurrence in ovarian dermoids, and sometimes are present in prodigious numbers (300). Teeth also occur in rectal and post-rectal dermoids. (Figs. 151 and 152.)

Exceptionally they have been found in dermoids arising

in the branchial clefts. This is a matter of some interest, because teeth are sometimes found associated with persistent branchial fistulæ. In 1890 I exhibited at the Pathological Society, London, an example of a persistent second branchial fistula in a sheep (Fig. 172); it was surmounted by a prominent cervical auricle beset on its posterior surface by a number of processes resembling the buccal papillæ of sheep. Protected

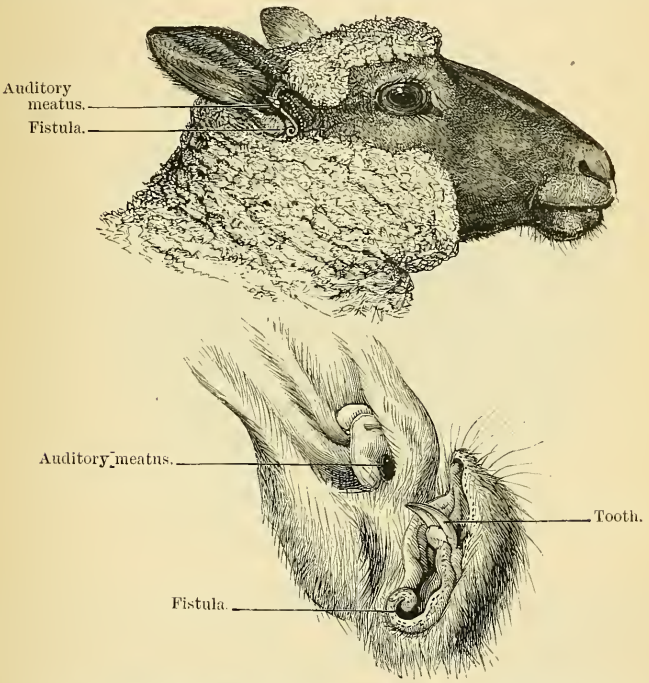

Fig. 172.—Head of a sheep with a branchial fistula, cervical auricle, and tooth. In the lower figure the auricle and tooth are shown of natural size.

by this auricle there was a slender, ill-formed, incisor tooth mounted on a pedicle of bone, surrounded by mucous membrane.* It is preserved in the museum of the Royal College of Surgeons. Kostanecki † has since published an account of a similar specimen. (*See also* Gurlt.‡)

Teeth are occasionally associated with the second branchial

* Trans. Path. Soc., vol. xlii. 477.
† Virchow's "Archiv," bd. cxxiii. 401.
‡ *Thierische Missgeburten*, 1877. Taf. xv.

cleft in horses. These specimens throw some light upon teeth found on the petrosal bones of oxen, of which some examples are preserved in the Veterinary Museum at Alfort, and render it possible that some of the curious cases of cervical teeth in the human subject, usually described as errant wisdom teeth, belong to the same category.

Teeth in dermoids are composed of dentine, enamel and

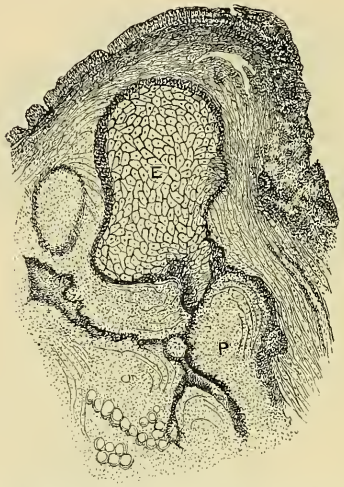

Fig. 173.—The germ of an ovarian tooth, from a dermoid. E, the enamel-organ; P, dentine papilla.

cementum arranged in the same manner as in normal teeth, and developed on the same plan. (Fig. 173.)

The consideration of glands and teeth in dermoids would be incomplete without an account of those peculiar concentric bodies known as **epithelial pearls.** These bodies vary somewhat in structure and probably arise in different ways. The common form of epithelial pearl consists of concentric laminæ of horny epithelium; the central portions in some specimens are structureless and transparent like horn (Fig. 174); in others the cells are large and distinct; in some the epithelium forms onion-like layers without any tendency to cornification.

The common mode by which epithelial pearls are formed is by the retention and subsequent moulding of shed epithelium in the recesses of sebaceous glands, in mucous crypts,

or in folds of epithelial-covered surfaces. They are sometimes found on the forehead along the margin of the hairy scalp;* they are common in the penis, at the junction of the prepuce and glans, and in the tonsils of children.

There is another variety which occurs in situations where epithelial surfaces become fused in the process of development, as, for example, along the middle line of the hard palate. It

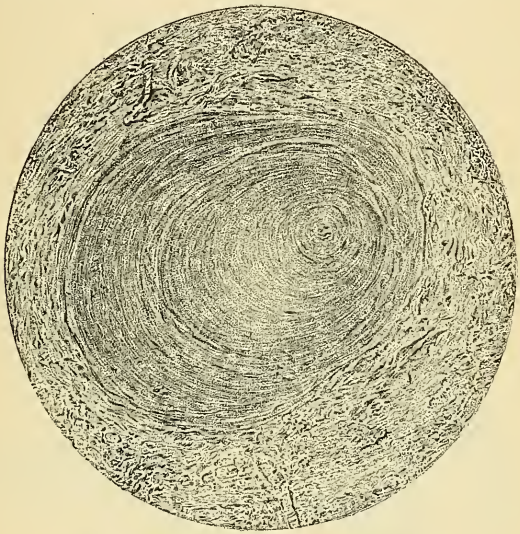

Fig. 174.—Epithelial pearl. (*After Kanthack.*)

is not unusual to find them in this situation in children at birth, and occasionally they will be found hanging by short pedicles, especially in the neighbourhood of the pre-maxillæ. They are sometimes met with on the under surface of the penis.

Epithelial pearls are often found in the gums. The largest examples that have come under my notice occurred in ovarian dermoids. In one remarkable specimen which I examined it was possible to trace every stage between a typical epithelial pearl and an enamel-organ. In a series of sections some showed the ingrowth of epithelium from the surface of a loculus; in a few, pearls were visible composed of large epithelial cells; whilst others exhibited laminæ of horny material

* *See* remarks on Cholesteatoma, p. 182.

and in some of the sections a developing tooth with its papilla, enamel-organ, and gubernaculum could be seen. These observations suggested that, apart from the retention of shed epithelium and the inclusion of epithelium between opposed surfaces, it is probable that pearls may arise in some instances by ingrowths of epithelium on the principle of enamel-organs. This view would be consistent with Kanthack's* observation on pearls of the hard palate, to the effect that when a series of sections is made it will usually be found that the pearl is connected with the surface by a tract of epithelium. This is further interesting, for it may serve to throw some light on meso-palatine teeth. It is well known that small supernumerary teeth in young children are not uncommon in the anterior segment of the meso-palatine suture. These teeth, which must not be confounded with the occasional third incisor, are usually lodged in the mucous membrane only. In 1890 I ventured to suggest that meso-palatine teeth are probably associated with these pearls.†

* *Journal of Anatomy and Physiology*, vol. xxv. 155.
† Trans. Odont. Soc. Gt. Britain, vol. xxii. 156.

CHAPTER XXXIX.

MOLES.

Moles are pigmented and usually hairy patches upon the skin. They are congenital or appear during the first few weeks of birth. Moles vary greatly in size; many are no

Fig. 175.—Extensive hairy mole upon the face of a boy a year old.

larger than split peas, while others cover an extensive area of the trunk, face, or limbs.

The common variety consists of a slightly raised patch, usually brown in colour; but it may be quite black, and is, as a rule, covered abundantly with hair. As moles occur in situations where hair is generally scanty, they are conspicuous objects. The hair growing upon the mole is commonly short,

like that upon the skin covering the trunk of a dog. Occasionally, however, it is as long as that naturally found upon the scalp. In a boy a year old I have seen nearly the whole of the trunk covered with a mole, and the hair growing from it was as long as that upon his head. When moles exist on the forehead they sometimes appear to be an extension of the hairy scalp. The hair upon moles does not differ

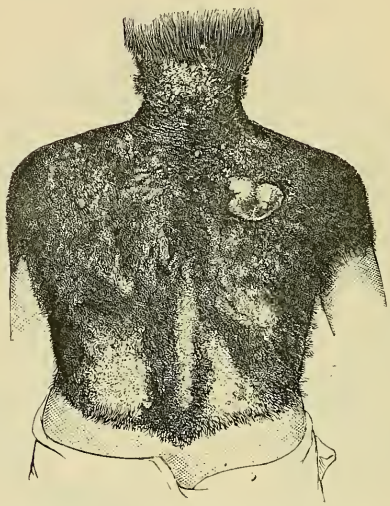

Fig. 176.—Extensive hairy mole on the trunk of a man, 47 years of age, which became the seat of sarcoma, from which the patient quickly died. (*After Lawson.**)

from hair in general, and is furnished with sebaceous glands; sweat glands are present when the mole is seated on a part of the skin where these glands normally exist. The amount of pigment varies much; in some moles it is so abundant as to produce an inky blackness. Moles are always very vascular; but the most striking feature in their histology is that the tissue immediately underlying them is often similar to that characteristic of an alveolar sarcoma.

The rarer form of mole consists of a patch of black, or deep-brown pigment overlying tissue similar to that of an alveolar sarcoma. These patches may or may not be raised above the level of the surrounding skin. The pigmented area

* Trans. Path. Soc., vol. xxiv. 256.

contains a few hairs which are not larger or longer than those in the immediate neighbourhood of the patch.

Small hairy moles do not as a rule cause much inconvenience even when they occur on the face, in which situation they are known as "beauty spots." As many as fifty moles may be present on one individual. When a mole is extensive, and occurs in an exposed situation (Fig. 175), it is a serious disfigurement. When very large moles occur on the trunk the hairy part is sometimes very sensitive, almost hyperæsthetic. In large moles pendulous skin folds are sometimes present; these folds are large in the young, but, as a rule, they shrink and become quite small in the adult.

Moles bleed freely when their surfaces are abraded or incised. They are also liable to ulcerate spontaneously; the ulcerated surface bleeds freely. The most important change to which they are liable is to become later in life the starting-point of melanomata, some of which are very infective, and quickly destroy life. (Fig. 176.) The relation of melanomata to moles is considered in chapter xiii.

Moles on the Conjunctiva.—The mucous membrane lining the ocular surface of the eyelids, and covering the cornea and adjacent portions of the eyeball, occasionally presents patches of skin which, in appearance and structure, are identical with hairy moles.

These dermoid patches, or conjunctival moles, occur most frequently at the margins of the cornea, and usually in the line of the palpebral fissure—that is, directly in the equator of the cornea; but they are by no means confined to these situations. Usually they are limited to the conjunctiva covering the sclerotic, or trespass but little on the cornea. Sometimes, however, they involve a considerable extent of the corneal surface. (Fig. 177.)

Wardrop* described a conjunctival mole in a man fifty years of age; it was congenital. Twelve long hairs grew from its middle, passed between the eyelids, and hung over the cheek. These hairs did not appear until the sixteenth year, at which time the beard began to grow.

Occasionally a mole will be found on each side of the

* "Morbid Anatomy of the Human Eye," 1834.

cornea in the line of the palpebral fissure. A very rare variety is limited to the caruncle. A good example is depicted in Fig. 178, associated with an eccentric pupil. This is simply an excessive development of the delicate hairs that normally beset the caruncle.

These moles are occasionally associated with malformations

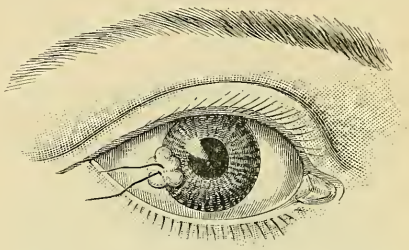

Fig. 177.—Conjunctival mole—common variety.

of the eyelids, especially the one known as **coloboma** of the upper eyelid, of which a good example is given in Fig. 179. When this association occurs, the defect in the lid corresponds

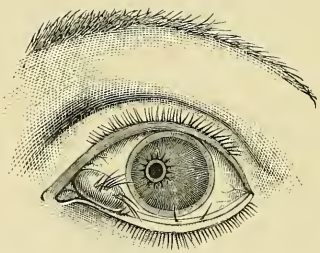

Fig. 178.—Mole on the caruncle, associated with an eccentric pupil. (*After Demours.**)

to the cutaneous patch on the conjunctiva. This combination is of some importance as it is used as evidence in support of an explanation that has been put forward in regard to these moles, based upon the development of the eyelids.

In the embryo the tissue covering the outer surface of the eyeball, which ultimately becomes the conjunctiva, is directly continuous, and in structure is identical with the skin at the margin of the orbit. Very early cutaneous folds arise,

* *Maladies des Yeux*, 1818, pl. lxiv., fig. 1.

gradually grow over the surface of the eyeball, and come into apposition at a spot corresponding to the future palpebral fissure. These folds ultimately become the eyelids. The surfaces of these folds, which are continuous with the covering of the eyeball, become converted into mucous membrane, and are termed conjunctiva. In every normal eye the conjunctiva

Fig. 179.—Conjunctival mole associated with coloboma of the eyelid, a mandibular tubercle, and accessory tragus. (*Cowell's* case*).

bears evidence of its transformation from skin, inasmuch as the caruncle at its inner angle is furnished with delicate hairs. It is reasonable to suppose that, as the occlusion of the proper covering of the eyeball by the eyelids is the cause of the conversion of the conjunctiva into mucous membrane, if from any cause a part, or even the whole of it, were left uncovered, the exposed part would persist as skin. This is precisely what occurs. When the eyelid is in the condition of coloboma (Fig. 179)—a defect due, in all probability, to the imperfect union of the embryonic eyelid to the skin covering the fronto-nasal plate—a piece of conjunctiva persists as skin, and forms

* Trans. Ophthal. Soc., vol. xi., p. 214.

a mole occupying the gap in the lid. Moles occur on the conjunctiva unassociated with colobomata, but in nearly every instance they are situated on the cornea in the line of the palpebral fissure. This circumstance would indicate that during development the conjunctiva was imperfectly covered by the developing lids. It should be remembered that in many eyes exactly in the situation in which moles are most frequently found, slight elevations or **pingueculæ** of the conjunctiva occur. These, when examined microscopically, will be found to contain epithelial elements.

Fig. 180.—Conjunctival mole in a sheep.

In a few very exceptional cases the eyes have been found completely covered with skin without any traces of eyelids. Such a condition is known as **cryptophthalmos**, and the explanation offered concerning it is, that in these cases the eyelids have failed to appear and in consequence the conjunctiva has persisted as skin.

Conjunctival moles have been observed in horses, sheep, oxen, and dogs, and are furnished with hair or wool according to the nature of the tegumentary covering characteristic of the mammal in which they occur. (Fig. 180.)

CHAPTER XL.

THE TREATMENT OF DERMOIDS.

Dermoids are innocent tumours. Some of them attain a certain size and then cease to grow; others will remain, as it were, torpid for years, then, without any obvious reason, suddenly resume active growth and reach a large size in a comparatively short space of time. Many, and perhaps the majority, steadily grow without intermission, uninfluenced by the rules of growth which govern the dimensions of organs in general. Thus no experience, however extensive, will enable a surgeon to assure a patient that a given dermoid will remain quiescent, or that it will become a large tumour. The closest observation by the best observers has failed to detect any laws regulating the growth of dermoids or of other tumours. Take, for example, dermoids of the scalp, or those at the angle of the orbit: some of these in an ordinary lifetime will not exceed the dimensions of a walnut, yet cases are known in which a dermoid of the scalp has grown as large as a cocoa-nut. (Fig. 142.)

It may be stated generally of sequestration dermoids that, as a rule, they remain of small size; but many exceptions occur. (Fig. 122.) Knowing then, the potentiality of these tumours, it is the custom, whenever they occur in accessible situations, to remove them early in infant life.

There are situations where the removal of a dermoid is not attempted—*e.g.*, when it grows between the laminæ of the tentorium cerebelli, or when a sternal dermoid invades the mediastinum or pleura. These cases are in the main post-mortem surprises.

There is a fact that should not be overlooked in regard to dermoids: so long as their capsules remain intact any evil influence they exert is mechanical; but when from any cause—*e.g.*, injury, ulceration, or communication with a hollow viscus like the intestine, bladder, or bronchus—putrefactive organisms gain access to their contents, rich in dead organic matter, decomposition with all its attendant evils is the result. This is well illustrated by the distressing histories of patients

with ovarian dermoids that have communicated with the bladder.

In three situations dermoids are very liable to destroy life :—(1) Intracranial dermoids, by the pressure they exercise on the brain ; (2) intrathoracic dermoids, by interference with the lung ; (3) pelvic dermoids which lead to intestinal obstruction by pressing on the rectum, or establish urinary troubles by becoming impacted in the pelvis and compressing the urethra or the ureters, or lead to septicæmia by the decomposition of their contents. Occasionally an ovarian dermoid interferes with delivery and causes the death of two lives, mother and child.

At present no one has succeeded in removing an **intracranial** dermoid. An accurate diagnosis is impossible, but it is highly probable that a surgeon, in operating for an intracranial tumour, will one day find himself face to face with a dermoid.

In the **thorax** the signs are usually those of empyema until " hair-spitting " occurs. The successful removal of an intrathoracic dermoid awaits accomplishment, whereas **ovarian dermoids** are removed successfully almost daily. Other varieties of pelvic dermoids, especially the **post-rectal** species, have been successfully enucleated by Bryant, Frederick Page, and W. W. Keen. (*See* page 320.)

Pedunculated **rectal** dermoids only require the same treatment as polypi—viz., ligature of the pedicle and detachment of the tumour. The large tubulo-dermoids found in the coccygeal region demand considerable judgment. In the majority of cases nature disposes of the difficulty either by destroying the child's life before it is born, or in the process of delivery. A few survive this event for some days or even weeks. Those which successfully escape these disasters are brought to surgeons, who endeavour to remove the tumours when they are satisfied that the children are strong enough to be submitted to this ordeal. Some successful cases have been reported ;* but many have failed. I collected the scattered records of surgical enterprise in this direction, but the analysis reveals that the various genera of sacro-coccygeal tumours have not been appreciated by surgeons:

* Mackay was successful in two cases. (*See* p. 319.)

so that it is difficult to decide whether the individual cases were dermoids, tubulo-dermoids, lipomata, teratomata, or spina bifida cysts. Thus the facts were useless for the purpose. It is to be hoped that future records will be more precise.

Dermoids in connection with the mouth do not offer any difficulty in treatment. **Pharyngeal** dermoids are easily avulsed, and in some cases have become spontaneously detached. **Palatine** dermoids and adenomata may be easily enucleated after their capsules have been incised; and in removing **lingual** dermoids it is only necessary to take care to thoroughly extirpate every portion of their cyst-walls, or troublesome sinuses will remain.

In removing a dermoid at the root of the nose the surgeon must not be surprised to find the capsule running deeply between the bones in that situation, and it not infrequently rests upon the dura mater.

The treatment of the various deformities connected with the fissures about the face—such as hare-lip, cleft palate, coloboma of the eyelid, etc.—does not come within the scope of this book. It will be necessary to consider the treatment of branchial fistulæ, median cervical fistulæ, cervical auricles, etc.

In the majority of cases **cervical fistulæ** give no trouble, but there are instances in which a fistula discharges fluid so as to become a source of annoyance, or it gets inflamed from time to time. Under these conditions it should be dissected out. Such operations must be recommended with caution, as these fistulæ extend deeply into the neck and run in very intimate relation with the great vessels of the neck and the vagus nerve.

Attempts to obliterate them by such methods as the application of caustics, heated wire, etc., are worse than useless. In removing median cervical fistulæ it is necessary to dissect the duct quite up to the body of the hyoid bone to ensure its thorough eradication.

Cervical auricles are, in most children, easily dissected out. When the auricle has connections extending to the deep surface of the sterno-mastoid, the operation requires care.

Hairy moles, when small and in situations where they cause disfigurement, should be excised. When carefully

performed the operation leaves scarcely a scar. Extensive moles upon the trunks and limbs are beyond treatment, but in the case of a large hairy mole on the face, it is necessary to adopt some method for its relief. Great good may be effected by the ingenious plan, introduced by Morrant Baker,* of carefully shaving the mole with a sharp scalpel so as to remove the pigmented portion of the skin and the layer that contains hair bulbs. The operation is usually attended by free but easily controlled bleeding, and the shaved surface heals without the formation of cicatricial tissue. Should some of the hairs persist after this treatment they may be destroyed by the application of nitric acid and similar caustics. Such an extensive mole as that represented in Fig. 175 is unfortunately beyond the reach of surgical art.

Small **conjunctival moles** may be dissected off as in the case of a ptergium; and if a coloboma of the lid is associated with it, the edges cleft may be vivified and united on the same principles employed in the treatment of hare-lip.

* Med. Chir. Trans., vol. lxi. 33.

CHAPTER XLI.

TERATOMATA.

STRICTLY, the consideration of teratomata belongs to that department of pathology known as teratology; but as certain

Fig. 181.—The twin sisters Radica and Doodica at the age of 3½ years; born in 1889 at Noapara, a village in the province of Orissa, India.*

species are so very apt to be confounded with dermoids, it is necessary to give a brief account of them here.

A **teratoma** is an irregular conglomerate mass containing the tissues and fragments of viscera of a suppressed fœtus attached to an otherwise normal individual.

* Cf. *The Medical Week*, vol. i., p. 11.

In order to appreciate the nature of these singular malformations it will be necessary to consider the subject of conjoined twins, supernumerary limbs, and acardiac fœtuses. In the animal and vegetable kingdom it occasionally happens

Fig. 182.—Laloo, a Hindoo, with an acardiac parasite attached to his thorax.

that a single ovum gives origin to two embryos, which may be quite separate from each other or they may be united, a condition known as **conjoined twins.** (Fig. 181.)

When two embryos are conjoined, and one goes on to complete development, whilst only certain parts of its companion continue to grow, the result is a **parasitic fœtus.** The mature individual supporting it is the **autosite.** (Fig. 182.)

In other examples the suppressed fœtus consists of an irregular-shaped tumour growing, perhaps, from the posterior

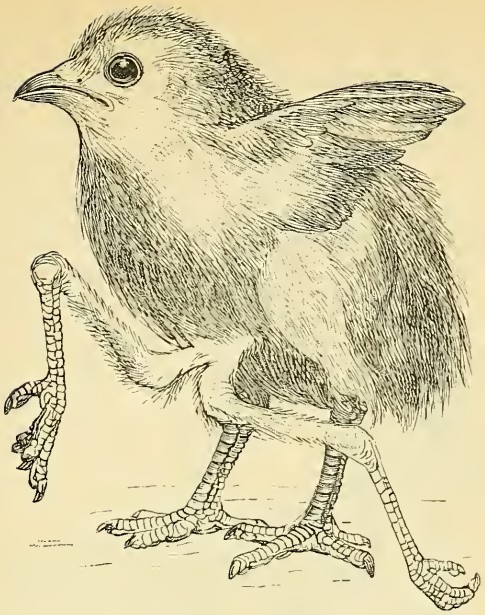

Fig. 183.—Chick with a supernumerary pair of legs projecting from the ventral aspect of the pelvis.

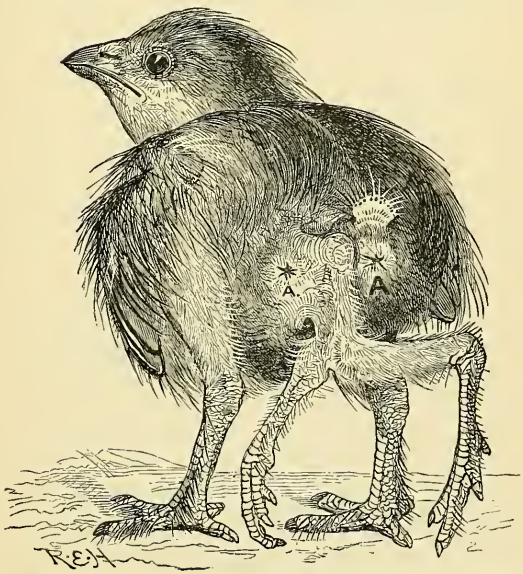

Fig. 184.—Chick with a supernumerary pair of legs projecting from the dorsal aspect of the pelvis. **A**, anus; A, supernumerary anus.

surface of the sacrum, or within the abdomen or thorax, which on dissection contains a few vertebræ, or processes of skin resembling digits, associated with a piece of intestine or an imperfect liver. This is a teratoma.

In order to demonstrate the relation between parasitic fœtuses such as Fig. 182 and teratomata, it will be useful to refer to dichotomy. In animals and vegetables there is a strong tendency for parts ending in free extremities to bifurcate or dichotomise. When this affects digits the result is supernumerary fingers and toes. Should it extend to the axis of the limb, supernumerary legs, wings, or fins are produced. Dichotomy is not confined to the limbs, but affects also the axis of the trunk. When the whole embryonic axis dichotomises, twins are produced. Should cleavage be partial, and affect the caudal end of the trunk, it is spoken of as posterior dichotomy. When it involves the anterior end it is called anterior dichotomy. With complete dichotomy in which both embryos go on to full development, either as separate or conjoined twins, we are not further concerned, and the conditions arising from the imperfect growth of one embryo whilst its companion continues to develop, must be deferred until we have discussed the results of partial dichotomy.

Fig. 185.—Frog (*Rana palustris*) with a supernumerary hind leg. (*After Tuckerman.**)

Posterior Dichotomy.—When cleavage involves the caudal section of the trunk axis to any serious extent it necessarily follows that the pelvis as well as the vertebral column will be reduplicated; it is also obvious that the reduplication of the pelvis involves a corresponding increase in the number of the pelvic organs, including the limbs. Thus it follows that supernumerary hind limbs may arise from dichotomy affecting the embryonic limb, or from cleavage of the caudal end of the trunk. The two modes also hold good for reduplication of

* *Journal of Anatomy and Physiology*, vol. xx., p. 516.

the fore limbs. The conditions and positions of supernumerary limbs due to posterior cleavage are represented by the chicks and frog in Figs. 183, 184, and 185. Thus the limbs may

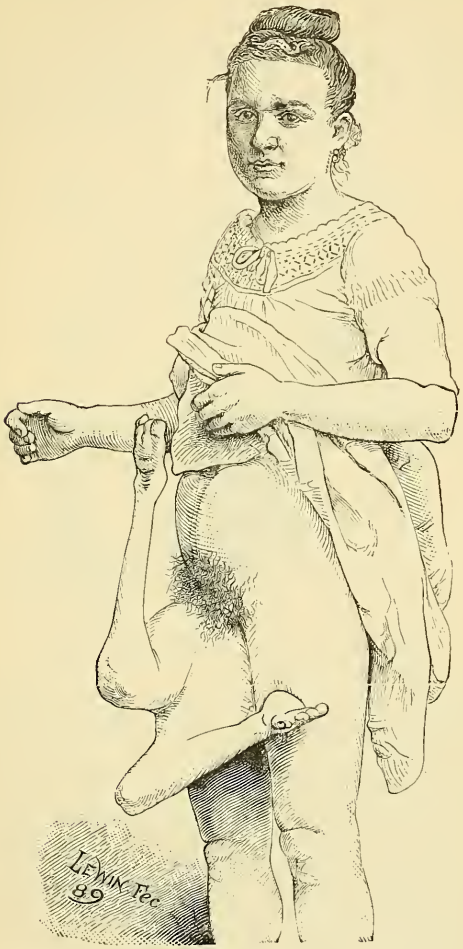

Fig. 186.—Louise L., *dame à quatre jambes.* (*Ed. Bugnion.*)

project from the ventral aspect of the pelvis, or be, as it were, dislocated on to the dorsal surface, as in Fig. 184. Occasionally they occupy a position midway between these two extremes and lie more or less parallel with the normal hind limbs, as in

Fig. 185. In some of the specimens the supernumerary legs fuse throughout the greater part of their extent, and in some, one leg becomes completely suppressed. It is a noteworthy fact that in all specimens of supernumerary limbs due to posterior dichotomy there is an accessory, but usually imperforate, anus.

Supernumerary hind limbs in every way identical with those exhibited by the chicks occur in the human species. A woman with an extra pair of limbs identical in its relations to

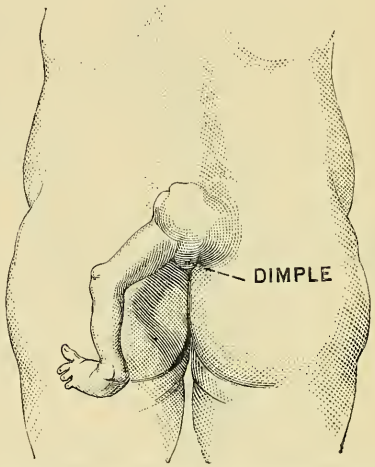

Fig. 187.—Sacral teratoma with a supernumerary leg.

the pelvis with those in the chick (Fig. 183) has been carefully described by Bugnion.* (Fig. 186.) In this case the woman could not initiate any movement in the accessory limbs, although she readily localised the prick of a pin made upon any part of them; she was also uncomfortable when the parasite was cold. In the furrow between the buttocks of the accessory limbs there was a fossa representing the imperforate anus and genital orifice of the parasite, situated about 12 cm. from the vulva of the woman.

An example corresponding to the dorsal limb in the toad (Fig. 193) is represented in Fig. 187. For an opportunity of studying this rare condition I am indebted to Dr. Matthews Duncan and Mr. H. Huxley. It was a female child; over the

* *Révue Méd. de la Suisse Romande*, June 20th, 1889.

posterior aspect of the sacrum there was an irregular lobulated mass, from which an ill-shaped limb projected, the foot being in the position known as talipes equino-varus. At the lower part of the tumour there was a depression indicating an imperforate ano-genital orifice.

The third variety is illustrated by the celebrated Jean Battiste dos Santos of Portugal. The chief features of this case were well described in 1846 by W. Acton,* and nineteen

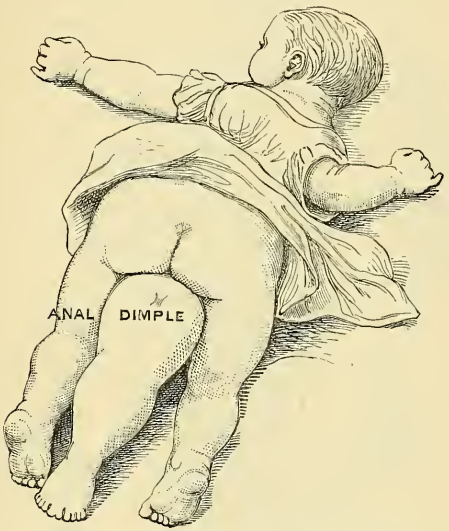

Fig. 188.—Posterior view of J. B. dos Santos at the age of six months. (*After Acton.*)

years later by Ernest Hart† in London, and by Handyside‡ in Edinburgh. The chief features of the case are shown in Fig. 188. The child has a median unpaired limb projecting from the pubes and situated between the normal limbs; its extremity has nine separate digits, but the middle one consists of two coalesced big toes. On that part of the limb which corresponds to the buttock there is a dimple representing the imperforate anus of the parasite; and there are two penes.

Reduplication of the pelvic limbs occurs frequently in

* Med-Chir. Trans., vol. xxix., p. 103.

† *Lancet*, 1865, vol. ii., p. 124.

‡ *Ed. Med. and Surg. Journal*, 1866, vol. xi., part ii., p. 833.

sheep, calves, and birds, and has been especially studied by Cleland.

Anterior Dichotomy.—Cleavage may affect the facial portion only and produce reduplication of the jaws, or it may involve the head and produce a two-headed individual. Should it extend to the thoracic region of the spine, then an animal with two heads and reduplicated fore limbs is the result. When partial dichotomy attacks the head the median parts of the reduplicated face are so conjoined and malformed that they are sometimes found hanging in the pharynx, being attached to its roof by a pedicle. Such tumours, called **basicranial teratomata,*** are very apt to be confounded with pharyngeal and palatine dermoids. (*See* page 298.)

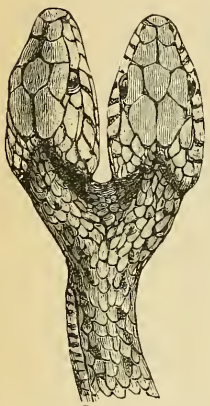

Fig. 189.—Cephalic extremity of a two-headed snake.

Examples of dichotomy involving the whole length of the cranial axis are by no means infrequent, but they occur more frequently in some groups of animals than in others. Many examples have been recorded in foals, in calves, and especially in snakes. (Fig. 189.)

Among the cases illustrating reduplication of the body as far backwards as the umbilicus the best known is the celebrated Ritta-Christina, born at Sassari, in Sardinia, 1829. After surviving her birth eight months and a half she died in Paris. Isidore Geoffroy Saint-Hilaire† gives an interesting account of the anatomy and physiology of this remarkable girl.

Harris‡ has carefully described a similar case known as the blended Tocci brothers. In these cases the adjacent upper limbs were quite distinct and well formed, but in some similar cases the limbs have coalesced, forming a median limb.

Thus far we have been concerned with reduplicated parts that reach such a standard of development that their identification is neither a matter of difficulty or doubt. It will

* *For* some examples, *cf.* Trans. Odont. Soc. of Great Britain, vol. xxi., 27.

† *L'Anomalies de l'Organisation*, tome iii., p. 119.

‡ *American Journal of Obstetrics*, vol. xxv., 460.

now be necessary to consider the meaning of those attached parts named parasitic fœtuses, and the shapeless masses to which the term teratomata in all strictness applies. This involves the consideration of the condition termed **acardiacus**.

It happens, and not infrequently, that in cases of twins

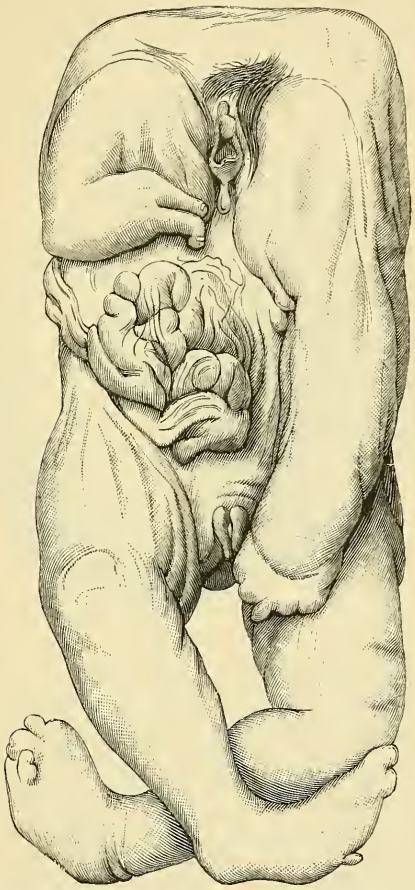

Fig. 190.—Acardiac fœtus. (*Museum, Middlesex Hospital.*)

one of the fœtuses is of natural shape and proportions and viable, but its companion is very imperfectly developed, and as it lacks a heart (or if this organ be present it is rudimentary and functionless) is said to be **acardiac**. The degree of development varies greatly.

A common example is sketched in Fig. 190. The head and neck are absent, the upper limbs are exceedingly rudimentary, and there is a hernia-like protrusion of viscera at the umbilicus. This specimen had no heart, lungs, or liver; but intestines, kidneys, and female genital organs were present.

In rarer cases the fœtus may be merely represented by an irregular-shaped mass consisting of œdematous integument surrounding a portion of the skeleton, usually an innominate bone with some of the bony elements of a lower limb.

In some specimens no particular skeletal element is

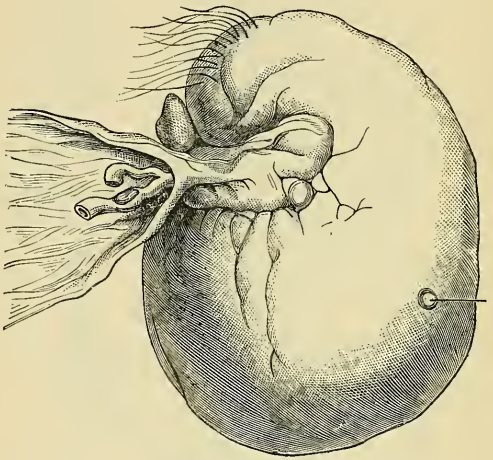

Fig. 191.—Acardiac fœtus.

recognisable, but a portion of intestine or rudiments of the genito-urinary organs can be detected. To such examples of acardiacus the adjective **amorphous** is applied, and to French Teratologists they are known as "anidian monsters." An acardiac such as Fig. 191 has been described as a dermoid of the umbilical cord.* (*See* also Fig. 192.)

Between the two forms represented in Figs. 190 and 191 every variety is met with, and in cases which admit of the determination of the sex this is invariably the same as that of the well-developed twin. It is also important to bear in mind that acardiacs can only occur in plural births.

Acardiacs are not necessarily separate from the well-

* Budin, *Progrès Medicale*, Dec. 31, 1887.

developed twin, but may be attached to it in a variety of ways. Many such examples have been placed on record, and in a few the autosite and acardiac parasite have lived and attained maturity.

One of the best examples of this was the Indian lad Laloo. He was born at Oovon in Oudh, and at the age of seventeen years was brought to London. This boy was exhibited at the

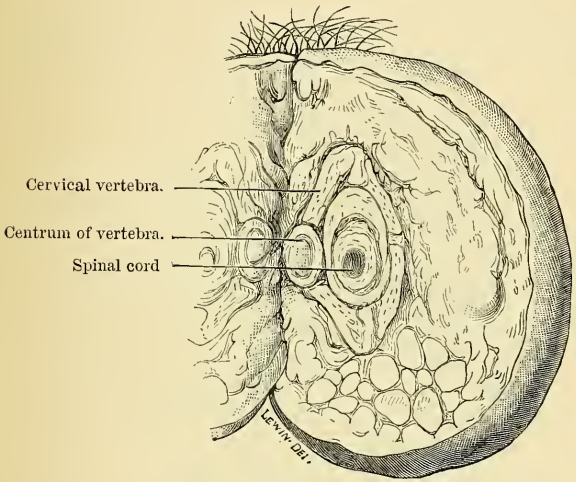

Fig. 192.—Acardiac in Fig. 191 shown in section.

Pathological Society in 1888, and in the Transactions for that year there is a detailed report of the lad drawn up by Mr. S. G. Shattock and myself. The general features of the case are shown in Fig. 182. The degree of development of the parasitic fœtus is similar to the variety of acardiacus shown in Fig. 190. It has arms and legs, a pelvis, urinary organs, and a well-formed penis. The parasite is attached to the thorax of the autosite by a bony pedicle near the xyphoid, but somewhat to the right of the middle line; its anus is imperforate and indicated by a shining linear scar.

It is an interesting fact that individuals such as Dos Santos are capable of begetting children, and the offspring do not share the deformity of the father. This also holds good for females with parasitic fœtuses. The woman represented in Fig. 186 had brought forth several well-formed children.

The explanation of acardiac fœtuses, whether free or parasitic, seems to be this:—Two embryos arise from a single ovum; in some instances the cleavage is complete, but the heart of one embryo is defective. The circulation of the two embryos is continuous at the placenta, and the heart of the normal embryo is able to maintain, in a measure, the blood-current in its companion, and thus save it from complete suppression. Sir Astley Cooper* demonstrated this compensatory mechanism in the case of an acardiacus placed in his hands by Dr. Hodgkin. An inspection of the drawing of

Fig. 193.—Young toad with a supernumerary hind limb.
(*Museum, University College, London.*)

the placenta from this case (Plate VII.) shows that the umbilical vessels in the two sections of the compound placenta were directly continuous.

In the case of a parasitic acardiac—*e.g.*, Laloo—the circulation must be directly maintained by the heart of the autosite, as an independent heart has not, so far as I am aware, been detected in the parasite. The blood current is always extremely slow in the acardiac, and thermometric observations demonstrate that its temperature is several degrees lower than that of the autosite.

Thus a study of the circumstances surrounding the development of twins and duplex monsters brings us to the conclusion that teratomata may arise either from partial dichotomy of the trunk axis of the embryo, or from complete dichotomy. In the latter case, while one twin has gone on to full development the growth of the other has been arrested,

* Guy's Hospital Reports, vol. i. 218, 1836.

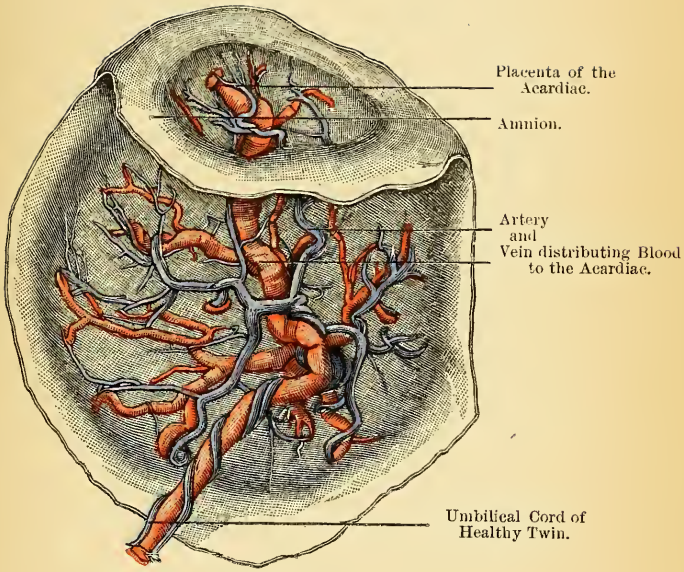

PLATE VII.—Placenta from a Case of Twins, one of which was an Acardiac. (*Astley Cooper.*)

and in some cases the suppression has been so great that the companion fœtus is represented by a deformed or shapeless mass consisting of integument covering ill-formed pieces of the skeleton and portions of viscera.

In a few cases of parasitic fœtuses we are able to offer a probable opinion as to whether the reduplicated parts are due to partial dichotomy of the trunk or are the result of complete cleavage, in which one of the fœtuses becomes an acardiac. In very many, indeed in the majority of teratomata, it is absolutely impossible to decide in favour of one method or the other.

Treatment.—Parasitic acardiacs are in almost all cases so extremely valuable as sources of gain in fairs, shows, and large cities that the parents, or the unscrupulous individuals who get possession of these children, will not permit operative interference. When the parasitic acardiac is of the amorphous variety (Fig. 191) and attached to the dorsal surface of the sacrum, attempts may be made to remove them. The children rarely survive the interference.

CHAPTER XLII.

GROUP IV.

CYSTS.

Cysts or Cystomata result from the abnormal dilatation of pre-existing tubules or cavities. In the simplest forms they consist of a wall usually composed of fibrous tissue, but it is not infrequently mixed with muscle-fibre. The cyst-contents may be mucus, bile, saliva, etc., according to the nature of the organ with which the cyst is associated.

Genera.	*Species.*
I. Retention cysts.	Hydrometra.
	Hydrosalpinx.
	Hydronephrosis.
	Hydrocholecyst.
II. Tubulo-cysts.	Vitello-intestinal.
	Allantoic (urachal).
	Paroöphoritic.
	Parovarian.
	Cysts of Gartner's duct.
	Cystic disease of testis.
	Encysted hydrocele of testis.
	Cysts of Müller's duct.
III. Hydroceles.	Of the tunica vaginalis.
	Of the canal of Nuck.
	Of the ovary.
	Of the neck.
IV. Gland cysts.	Ranulæ.
	Pancreatic-cysts.
	Chyle-cysts.
	Dacryops.

There are conditions often classed as cysts which are arranged in a sub-group entitled **Pseudo-cysts.**

I. Diverticula.	Intestinal; Vesical; Pharyngeal; Œsophageal; Tracheal; Synovial; Meningeal.
II. Bursæ.	Bursa.

Genera.	*Species.*
III. Neural cysts.	Hydrocephalus.
	Hydrocele of fourth ventricle.
	Meningocele (cranial).
	Spina bifida.
IV. Parasites.	Hydatids.

RETENTION CYSTS.

When the duct of a gland becomes obstructed the fluid, hindered from escaping, accumulates in the ducts and acini and dilates them. If the hindrance to the free flow of the secretion is maintained, or oft repeated, the glandular tissue becomes impaired, then atrophies, and finally the gland and its duct become converted into a fluid-containing sac or cyst.

It is generally believed that when the duct of a gland is completely obstructed the conversion of the parts into a cyst is a passive process; but occasion will be taken in the course of this section to show that this is not the case. When an excretory duct is so completely obstructed that no secretion escapes, then the gland rapidly atrophies. Retention cysts are due to obstruction to the free flow of secretion, or temporary arrests of the flow frequently recurring. The best example of cysts arising in this way are those due to dilatation of the pelvis and infundibula of the kidney—a condition known by the term **hydronephrosis.**

The purest forms of retention cysts arise in connection with hollow organs, the inner walls of which are provided with glands. The vermiform appendix is a case in point. This tubular structure is richly provided with glands. (Fig. 194.) Occasionally the communication of the appendix with the cæcum is obstructed, and the glands continuing to secrete, the accumulating fluid distends the appendix into a sausage-shaped cyst and sets up local symptoms of great severity.

The uterus is another example. After a difficult labour the walls of the cervical canal are not infrequently damaged, and in the process of repair, the canal may become obstructed. This leads to retention of the products secreted by the uterine glands, and the uterus will attain such proportions as to cause the enlargement to be attributed to pregnancy; the condition is known as **hydrometra.** It is occasionally seen in women, but is more common in mammals normally furnished with

bicornuate uteri, such as ewes, cows, mares, and sows. It may be unilateral or bilateral. When occurring in mammals in which the uterus has long cornua—*e.g.*, cat, bitch, hare, etc.—the distended cornua are apt to be confounded with Fallopian tubes. It may affect one or both cornua of a bihorned uterus in women.

The danger of retention of this kind is not so much due to the size of the cyst as to the great risk that ensues when

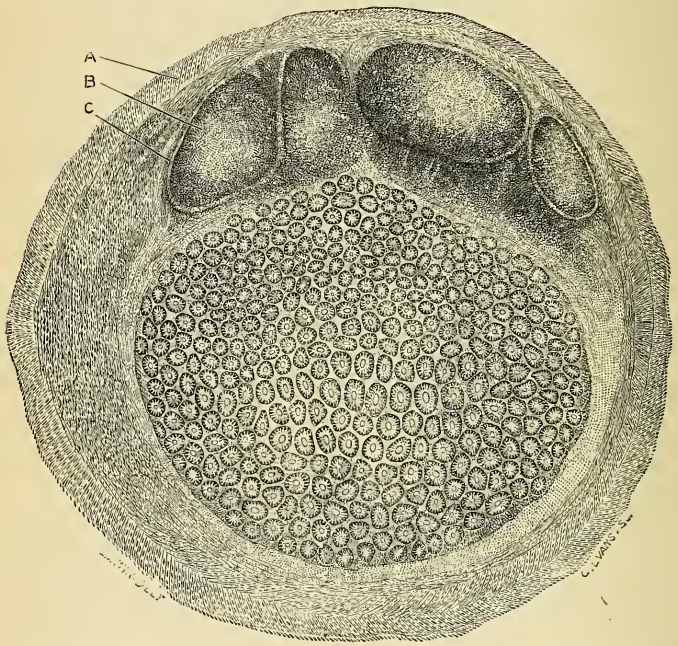

Fig. 194.—Section through the tip of the vermiform appendix, to show the abundance of its glands. A, outer coat; B, adenoid tissue; C, muscular capsule to the adenoid tissue.

large collections of retained secretions are invaded by putrefactive organisms. The cysts in such an event become converted into abscesses and the life of the individual is greatly imperilled. These changes in retention cysts are indicated by special names—as pyometra, pyonephrosis, etc.

HYDRONEPHROSIS.

The mode of origin of retention cysts may be studied in the kidneys. The secretion from these glands is conducted into the bladder by means of two ducts 35 cm. (14 inches)

long, known as the ureters: the urine is discharged from the bladder through the urethra. If from any cause the urine is hindered from escaping freely, either from the bladder or from

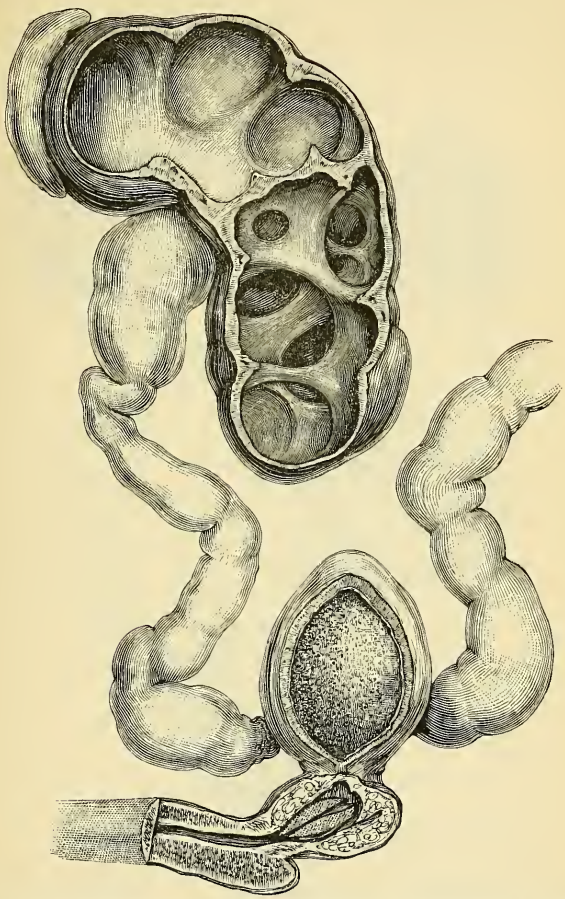

Fig. 195.—Hydronephrosis secondary to a large calculus in the bladder; two fragments of calculus occupy the prostatic portion of the urethra. The left kidney was in a similar condition. The patient, a man twenty-six years of age, died with complete suppression of urine. (*Museum, Middlesex Hospital.*) [$\frac{1}{3}$ *nat. size.*]

the ureters into the bladder, it accumulates in the ureters and dilates them; the pressure then acts upon the pelvis of the kidney, and if maintained causes the renal pelvis to be dilated into a large sac, converts the infundibula into large tubes, and finally induces atrophy of the renal tissue until the kidney is

converted into a multilocular sac. To a kidney thus converted the term **hydronephrosis** is applied. (Fig. 195.)

Hydronephrosis arises from a variety of causes. It must be borne in mind that when the obstruction is complete and persists, the kidney very rapidly atrophies. Large examples of hydronephrosis are produced by partial obstruction to the

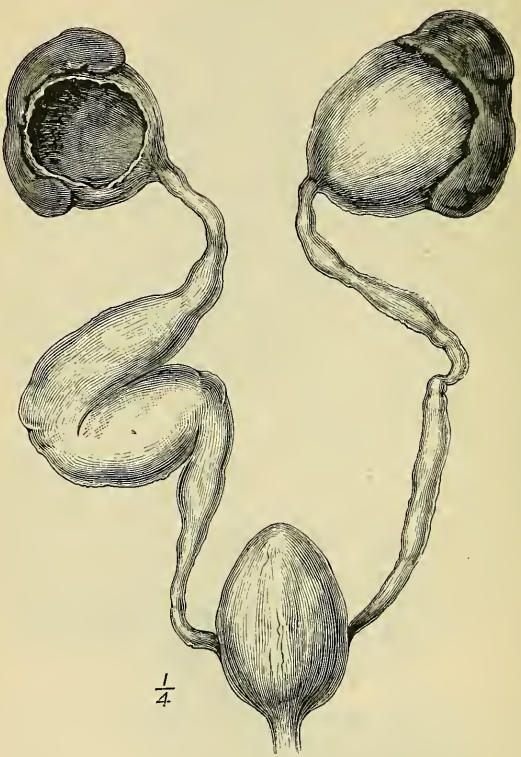

Fig. 196.—Bilateral hydronephrosis in a new-born child. (*Museum, Middlesex Hospital.*)

flow of urine, or frequently recurring attacks of complete obstruction.

Hydronephrosis may be bilateral or unilateral. When the obstruction is at the neck of the bladder or in the urethra, it will be bilateral.

The chief causes of **bilateral hydronephrosis** are—

Impacted calculus in the urethra, or near the neck of the

bladder (Fig. 197) and urethral stricture. Tumours of the prostate gland, especially pedunculated adenomata (Fig. 115), or pressure upon the urethra by an impacted uterine myoma. Bilateral hydronephrosis may also arise from pressure on both ureters—*e.g.*, by a hydatid cyst of the pelvis, by a large uterine myoma, or other variety of pelvic tumour (page 173). The condition is occasionally congenital, and the most careful examination fails to detect a cause. (Fig. 196.)

Unilateral hydronephrosis has many causes :—The retention of a calculus in the vesical segment of the ureter ; tumour (villous) of the bladder situated near or at the vesical orifice of the ureter; calculus lodged in the pelvis of the kidney: papilloma of the renal pelvis; axial rotation of the kidney leading to kinking of the ureter; tumours involving the ureter, as in cancer of the uterus; or pressing upon it from without, as myomata of the uterus; ovarian cysts and tumours of the pelvic bones.

In double hydronephrosis secondary to obstruction at the neck of the bladder an interesting change may sometimes be observed at the vesical orifices of the ureters. Normally, these openings scarcely admit a fine probe, but under the conditions just mentioned will assume a circular form, and be so large as readily to admit the tip of the little finger, so that fluid injected into the bladder through the urethra will enter the ureters and gain the dilated pelvis of the kidney. This condition is particularly apt to supervene upon oft-repeated attacks of retention of urine, secondary to pressure on the urethra exercised by a myomatous uterus lying low in the pelvis, and becoming impacted immediately before, and at the incidence of each menstrual period. It is a curious fact that some of the largest hydronephroses, unilateral and bilateral, that have come under my notice have been cases in which it was impossible to assign an adequate cause. (Fig. 198.) The most remarkable example of this is the celebrated case of Mary Nix,* aged twenty-three years. She died at Hampton-Poyle, near Oxford, with a large hydronephrosis containing fluid to the amount of thirty gallons, wine measure. The dissection of the body was

* Phil. Trans., 1747, vol. xliv. p. 337.

made by Samuel Glass, with "some learned gentlemen of the university." I have read the account very critically, and feel

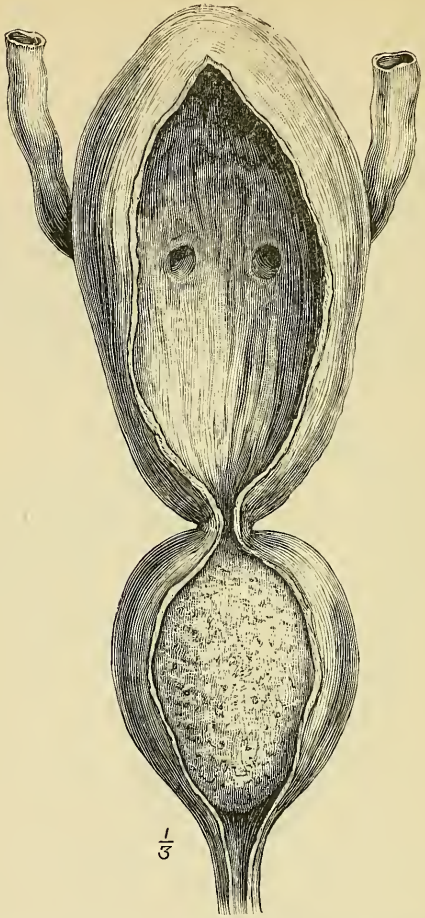

Fig. 197.—Calculus impacted in the urethra of a gelding, producing wide dilatation of the vesical orifices of the ureters and double hydronephrosis.

there is no doubt as to the renal origin of the hydronephrosis. Nothing was found to account for it.

Intermitting Hydronephrosis.—When a hydronephrotic kidney is of large size it can be perceived clinically as a definite tumour. It occasionally happens that patients come under observation with a swelling in the loin which can be

readily perceived at one examination but not at another, or it obviously diminishes in bulk without completely vanishing. In some of these cases the patients are able to state definitely that, coincidently with the diminution in the volume of the tumour, there has been a sudden increase in the quantity of the urine voided. The urine in some instances has been

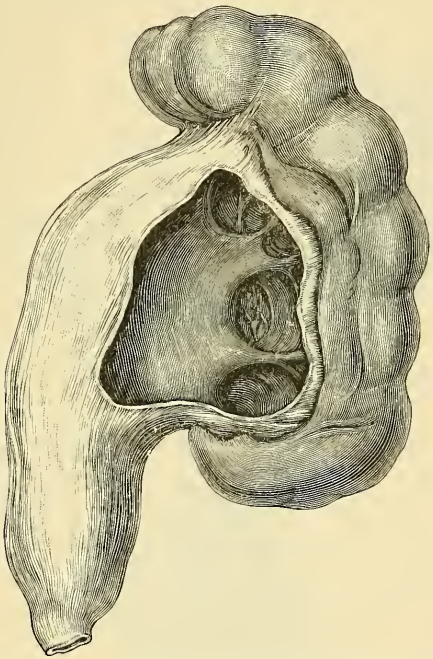

Fig. 198.—Unilateral (intermitting) hydronephrosis. The ureter, at the point where it left the renal sinus, had a diameter of 8 cm. (*Museum, Middlesex Hospital.*)

found to contain traces of blood and mucus. To hydronephrosis of this kind the term **intermitting** is applied.

It must be borne in mind that there may be difficulty in some cases in deciding clinically between a very large hydronephrotic cyst and an ovarian or parovarian cyst, and it is well established that cysts of the ovary and parovarium sometimes rupture, and the fluid, escaping into the peritoneum, is absorbed into the circulation and rapidly excreted by the kidneys. Thus, *profuse diuresis following upon the sudden disappearance or diminution of an abdominal tumour is as*

characteristic of rupture of an ovarian cyst as of an intermitting renal cyst.

There can be little doubt that nearly all hydronephroses intermit, but the term intermitting hydronephrosis is reserved for those examples in which great diminution, and in some

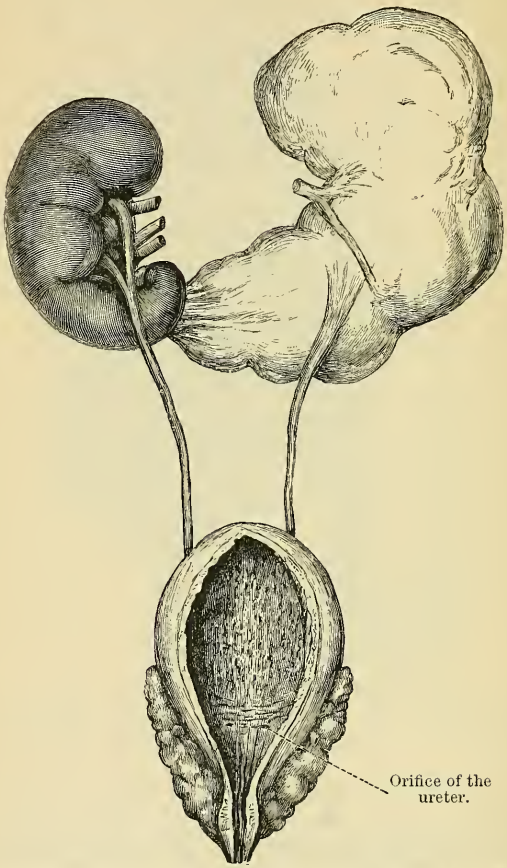

Fig. 199.—Pyonephrosis of one half of a horse-shoe kidney (*Museum, Middlesex Hospital*). (*H. Morris.*)

instances temporary disappearance, of the swelling takes place.

Exceptionally, both kidneys when hydronephrotic may intermit alternately. Of this rare form I have had one case under my care; as the diagnosis was somewhat obscure,

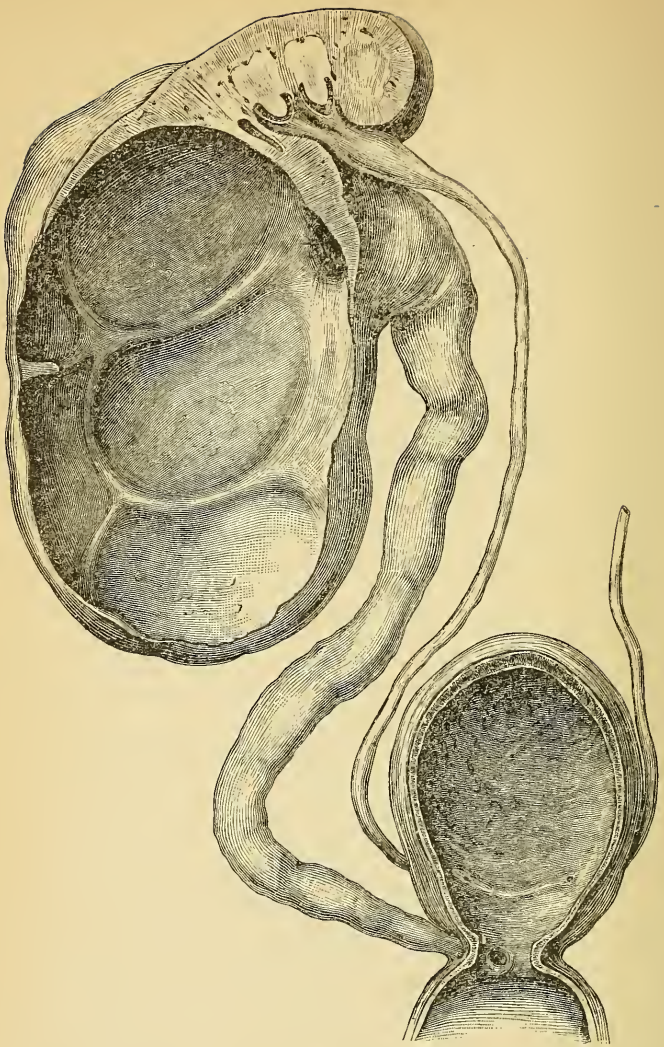

PLATE VIII.—Right Kidney with two Ureters, one of which opens into the Bladder at the vesical orifice of the Urethra; the lower half of the Kidney drained by this Ureter is converted into a pyonephrosis. The upper half drained by the normal Ureter is healthy. The left Kidney was normal. (*Museum, Middlesex Hospital.*) ½ nat. size.

the tumours were explored through an abdominal incision. In the course of the proceeding the phenomenon of intermission was actually observed. The hydronephrosis diminished in size, and the bladder slowly filled.

There are a few rare varieties of renal cysts that may be mentioned, such as hydronephrosis of one half of a horse-shoe kidney (Fig. 199); or a kidney may have two ureters, one of which, with the portion of the kidney drained by it, becomes dilated and sacculated, the other half of the kidney remaining healthy. (Plate VIII.)

When putrefactive organisms gain entrance to a dilated renal pelvis, either from the bladder by way of the ureter, or from the colon adjacent, suppuration ensues and the cyst becomes a **pyonephrosis.**

Hydrocholecysts.—The gall bladder consists of three coats of which the middle one contains unstriped muscle fibre: the inner one is mucous membrane, its epithelium being directly continuous with that lining the hepatic ducts on the one hand and with the epithelium covering the duodenum on the other. The outer coat is derived from the peritoneum and subserous tissue. Bile from the hepatic ducts finds its way into the gall bladder by way of the cystic duct, and when it escapes from the gall bladder it again traverses the cystic duct and passes along the common bile duct to the duodenum. The common duct just as it enters the wall of the intestine receives the duct of the pancreas. The point of junction is indicated by a slight recess known as the diverticulum of Vater. The peculiar arrangement of the ducts leading to and from the gall bladder renders it peculiarly liable to have its communications interfered with. Obstruction may occur in the cystic duct, in the common duct, in the diverticulum of Vater, or in the wall of the duodenum. The obstruction may be due to impacted gall-stones, a pancreatic concretion in the diverticulum, tumours of the pancreas, duodenum, etc.

When obstruction in the **common duct** is complete and persistent, the gall bladder may atrophy. When incomplete, or if complete the obstruction be only temporary, and especially if frequently repeated, the gall bladder will become greatly distended. When the cystic duct is obstructed, and no bile finds its way into the gall bladder, the latter may become

so distended with mucoid fluid, and attain such large proportions as to be mistaken for an ovarian cyst. The fluid that accumulates in the gall bladder under these conditions is probably the result of cholecystitis; such a distended gall bladder is called a **hydrocholecyts.** Sometimes adhesions occur between the dilated gall bladder and adjacent intestine (duodenum or colon), intestinal fluids gain access to it, and suppuration ensues, converting it into a **pyocholecyst.** Sometimes a fistula forms between the intestine and the cyst. Suppuration may occur in the gall bladder in consequence of septic organisms finding their way into it from the intestine along the ducts of the gall bladder.

Treatment.—During the last ten years very great advances have been made in the surgical treatment of cystic tumours of all kinds, and the principle is gaining ground that when it is possible to remove them without greatly endangering life, this radical mode of treatment gives the most satisfactory results.

This is well borne out in the case of **unilateral hydronephrosis.** When the surgeon is satisfied that an individual has a large sacculated kidney, and the fellow gland is in good condition and performing its functions properly, the hydronephrotic cyst can be removed through an incision in the loin with as little risk as attends the excision of simple ovarian or parovarian cysts. It is undesirable in a work of this kind to enter into details regarding the surgical treatment of such cysts. Certain it is that surgeons were formerly content, when they considered it necessary to interfere with a hydronephrotic cyst, to expose the cyst-wall through a lumbar incision, incise it, evacuate the contents and, by stitching the cyst to the edges of the skin-wound, establish a fistula. Henry Morris, however, has demonstrated that the best method of dealing with a unilateral hydronephrosis is to remove the cyst completely (nephrectomy), and this excellent practice is becoming universal among surgeons and is as successful as ovariotomy.

It is a peculiar circumstance that in many instances a hydronephrosis has assumed such large dimensions as to extend into the false pelvis and simulate an ovarian tumour. In many instances the resemblance has been so close that

experienced physicians and expert surgeons have been so deceived that operations have been performed as for ovariotomy, until the abdomen was opened and the error discovered. In such a case the surgeon should ascertain if the companion kidney is healthy, then close the abdominal incision and remove the hydronephrosis through an opening in the loin. This class of case furnishes admirable results.

The surgical treatment of dilated gall bladders **(hydrocholecysts)** is in a sort of transition stage. The ideal operation is removal of the gall bladder after ligature of the cystic duct (cholecystectomy); but there are many difficulties to surmount before it will be possible to carry out this manœuvre, save in exceptional cases. At present the safest practice consists in exposing the gall bladder through an incision in the belly-wall, evacuating its contents, and removing the blockade if possible; the cyst is then stitched to the edges of the peritoneum and the wound allowed to close by granulation.

The Guttural Pouches of the Horse.—In man the pharyngeal orifice of each Eustachian tube opens in relation with a bay or recess termed the fossa of Rosenmüller. In the horse they terminate in a very different manner. When the head is removed at the occipito-atlantal articulation, and the pharynx, with the associated structures, carefully dissected from the muscles on the ventral aspect of the cervical region of the spine, it will be found, as a rule, difficult to avoid cutting into two large sacs separated from the atlas and axis by loose connective tissue. These sacs reach to the base of the skull, extend downwards to the larynx, and send processes to occupy the intervals between the long styloid processes and the mandible. These sacs are the *guttural pouches;* they abut upon, but have no communication with each other, and occupy the whole of the naso-pharynx. Each pouch is lined with delicate mucous membrane containing glands and furnished with ciliated epithelium.

The mucous membrane of the guttural pouches is directly continuous with that lining the Eustachian tubes. The pouches themselves appear as large saccular dilatations of the terminal ends of the tubes, and for this reason they are termed by some writers the Eustachian pouches. Each pouch opens into the pharynx immediately above the soft palate by a valvular orifice; one side of the valve is formed by the leaf-like termination of the Eustachian tube. Of the functions of these pouches nothing is known. They are often a source of inconvenience to horses, for the mucous membrane is very prone to become inflamed, and the scanty outlet for the secretion leads to its retention and the consequent dilatation of the sacs. When enlarged in this way they may have a capacity of six or more ounces each. The retained secretion may decompose, and the sac

become distended with pus, which is discharged at intervals through the nose; or the pharyngeal orifice may be occluded, and the pouches enlarge to such an extent as to require an incision through the skin of the neck, or through the mouth.

Not infrequently the contents of the pouches become inspissated and formed into concretions. These are of different shapes and sizes, and vary

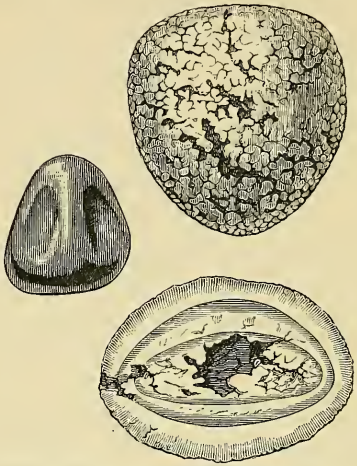

Fig. 200.—Concretions from the guttural pouches of horses. (*Nat. size.*)

in number from one, two, or three to fifty or even more. Generally they are of an oval shape; not infrequently they resemble beans. In consistence these concretions are like cheese, and on section have a laminated appearance. They are composed of mucus and inflammatory products mixed up with inorganic particles. (Fig. 200.)

The grit in these concretions enables an explanation to be offered concerning the liability of the pouches to attacks of inflammation. As the orifices of the pouches are in direct communication with the nasal passages, dust can easily gain entrance into them when snuffed up with fragments of hay, straw, dried seeds, and other organic and inorganic particles from dusty nose-bags and mangers.

CHAPTER XLIII.

TUBULO-CYSTS.

The human body, in common with that of many mammals, contains a certain number of tubes which, so far as is known, serve no useful purpose in the adult, and may be called in consequence **functionless ducts.** Some of these—*e.g.*, the vitello-intestinal duct and the urachus—were probably useful to the embryo; others, like the paro-varium and Gartner's duct, are serviceable in the male, as they act as conduits to the testis. Functionless ducts must not be confounded with **obsolete canals**: these serve no useful purpose in man, but were, in all probability, functional in the ancestors of existing vertebrata (page 308). Both sets of canals are of interest to the pathologist, as they are the source of cysts which are not only inconvenient to the individual, but actually dangerous to life.

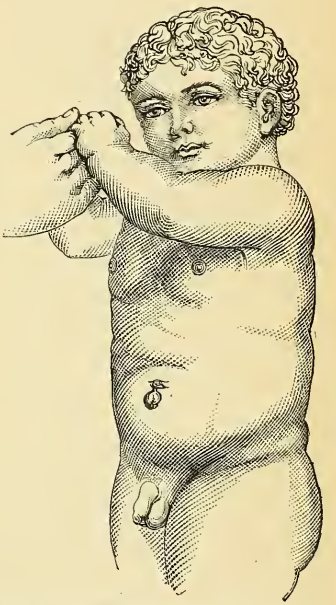

Fig. 201.—Congenital pedunculated tumour of the navel.

The genus **Tubulo-Cysts** includes the seven following species:—(1) Cysts of the vitello-intestinal duct; (2) Allantoic (urachus) cysts; (3) Paroöphoritic cysts; (4) Parovarian cysts; (5) Cystic disease (adenoma) of the testis; (6) Cysts of Gartner's duct; and (7) Cysts of Müller's duct.

Cysts of the Vitello-Intestinal Duct.—It is not uncommon to find connected with the umbilicus of babes and young children small tumours varying in size from a pea to a cherry. These tumours are of a bright red colour, soft and velvety to the touch, and are, as a rule, connected to the navel by

slender pedicles, and in appearance resemble red currants; occasionally they are sessile. (Fig. 201.)

These tumours are composed of unstriped muscle fibre, mucous membrane, Lieberkühn's follicles, and columnar epithelium collected into a mass. Typical cases have been carefully described by Kolaczek,* Colman†, and others.

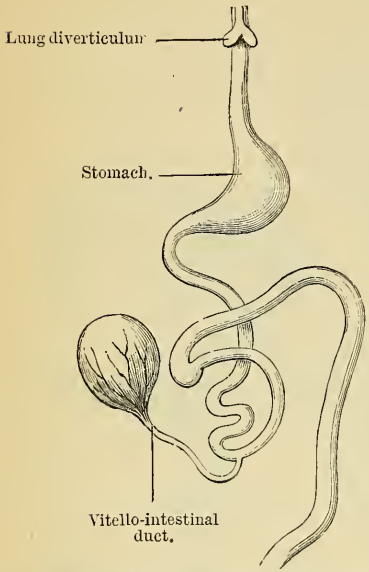

Fig. 202.—Diagram of the alimentary canal of the embryo, showing the position of the yolk sac.

In rarer cases the umbilicus is occupied by a cyst, which may project externally or internally. Such a cyst is lined with mucous membrane furnished with villi, columnar epithelium and follicles. A cyst of this character is easily confounded with the sac of an umbilical hernia.

Roser‡ reported a case in which a young man came under his care with a sinus at the umbilicus from which a slimy discharge issued. Some time before, a surgeon had removed a small cyst which projected from the navel, but the wound never healed. The discharge from the sinus frequently corroded the surrounding skin. On introducing a probe, the sinus was found to lead into a cavity measuring six centimetres in diameter. The cyst was removed, and microscopical examination showed it to present all the histological characters of intestine.

Zumwinkel§ has described the case of a girl seven years of age who had a small fistula on the left side of the navel from which slimy fluid issued. The skin surrounding the fistula was ulcerated. A probe introduced into the opening entered

* Langenbeck's "Archiv," bd. xviii., s. 349.
† Trans. Path. Soc., vol. xxxix., p. 110.
‡ Langenbeck's "Archiv," bd. xx., s. 472.
§ Langenbeck's "Archiv," bd. xl., s. 838.

to the depth of 1 cm. The parts were explored through an incision, and a cyst the size of a cherry exposed and removed. The cyst exhibited the histological features of small intestine.

The structure and position of pedunculated tumours and sessile cysts at the navel indicate the structure from which they arise—viz., a remnant of the vitello-intestinal duct which, in the embryo, traverses this part of the abdominal wall (Fig. 202). In transverse sections of the umbilical cord, close to the belly-wall of the embryo at the fifth month, the vitello-intestinal duct can often be detected, with its lumen lined with sub-columnar epithelium. It is also well known that the duct, instead of shrivelling, sometimes grows *pari passu* with the gut to which it is connected, and acquires a lumen almost equal to that of the ileum. Instead of persisting from the gut to the navel the duct may atrophy, leaving a small portion attached to the intestine or to the abdominal wall. Such remnants may develop into cysts the walls of which are identical in structure with those of small intestine.

A much rarer variety of cyst arising in a remnant of the vitello-intestinal duct is due to the distension of that portion of the duct which is connected with the ileum. In recently hatched chicks the intestinal attachment of the duct is often indicated by a nipple-like process on the free border of the gut. This is hollow, but does not communicate with the lumen of the ileum. As a rule it atrophies completely. It may, however, grow and form a large cyst. In Fig. 203 a piece of intestine from an emu chick is shown with a large cyst suspended from it by means of a narrow and acutely-torsioned pedicle. This cyst in all probability originated in a persistent portion of the vitello-intestinal duct.

Cysts of like proportions and of identical origin have been recorded in the human subject. One of the best-known cases was reported by Roth.*

Occasionally a persistent vitello-intestinal duct will remain open at the umbilicus and discharge fæces. Such cases have been successfully dealt with by surgeons.†

There are few structures in our bodies more capable of exciting philosophical speculation than the yolk sac and its

* Virchow's "Archiv," bd. lxxxvi., s. 371.

† Battle, Trans. Clin. Soc., vol. xxvi.

duct. This organ may in man and all the higher mammals be regarded as vestigial, for its duties have been in part abrogated by the allantois, but more completely by the placenta. In the human embryo, it is the function of the allantois to

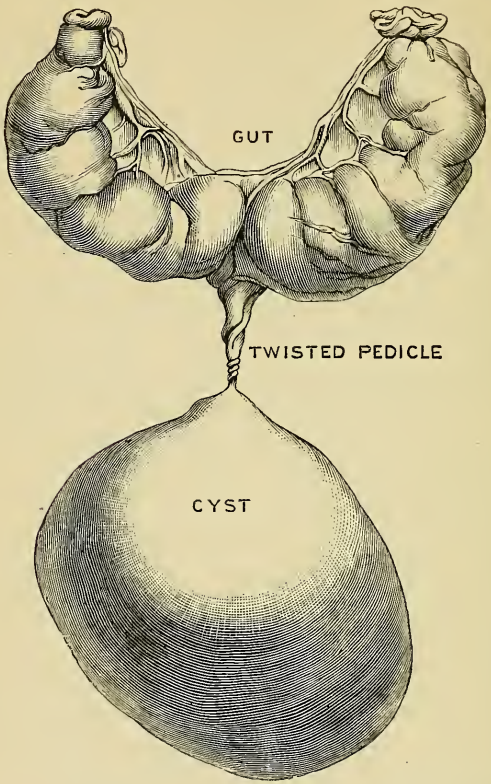

Fig. 203.—Cyst, probably of the vitello-intestinal duct, attached to the intestine of an emu. (*Museum, Royal College of Surgeons.*)

convey the blood-vessels which it receives from the developing aorta and distribute them to those chorionic villi destined to form the fœtal portion of the placenta.

In some sharks the yolk sac is covered with vascular villous tufts which fit into depressions of the oviduct. Even in some mammals—*e.g.*, guinea-pigs—the yolk sac enters into vascular connection with the uterine mucous membrane. There are abundant and good reasons for Balfour's conclusions

that placental mammals are descendants of forms the embryos of which had large yolk sacs; but the yolk became reduced in quantity owing to the nutriment the embryo received from the maternal tissues by means of the vascular connection of the yolk sac with the uterine wall. Subsequently the function of the yolk sac became limited by the allantois and the gradual evolution of the placenta, and finally, so far as man is concerned, abolished. Thus in man it is vestigial, and like such structures in general, is liable to many vagaries.

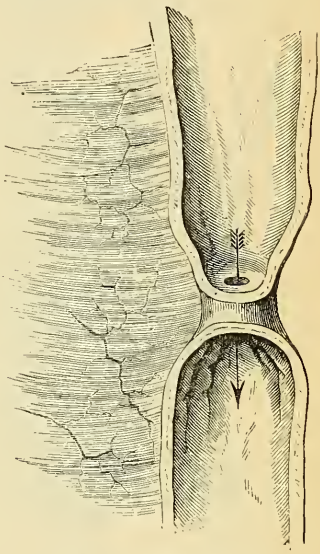

Fig. 204.—Septate ileum. (*Museum, Middlesex Hospital.*)

There is good reason to believe that the vitello-intestinal duct, besides being a source of cysts, is also responsible for the curious defect in the ileum to which I have applied the name **imperforate ileum**. It occasionally happens that the lumen of the ileum is interrupted by a perforated diaphragm (Fig. 204). To such a condition the term **septate ileum** is applicable. When such a diaphragm is present its situation is sometimes indicated by a marked constriction of the gut. In other specimens a more or less perfect valve of this kind is associated with a persistent duct (Fig. 205). In such cases the duct opens into the ileum on the distal side of the valve. In other instances the ileum becomes greatly dilated near its middle, and the walls are much hypertrophied; to this succeeds a narrow isthmus which opens into a normal segment of ileum. Lastly, in the complete form the ileum is interrupted as in Fig. 206.

These curious defects are attributable to the influence of the vitello-intestinal duct because they always occur in that portion of the ileum to which the duct, when persistent, is attached—that is, they do not occur within 30 cm. of the ileo-cæcal valve, and are rarely found at a greater distance than 1 m. from the cæcum.

The most reliable evidence for associating these defects with the duct of the yolk sac is that furnished by Fig. 205, in which a persistent duct and a valve co-exist. In my early observations I had regarded imperforate ileum as depending upon the influence of the vitello-intestinal duct, and subsequent observations put the speculation on a sound basis.* The specimens which demonstrate these views are preserved in the museum of the Middlesex Hospital.

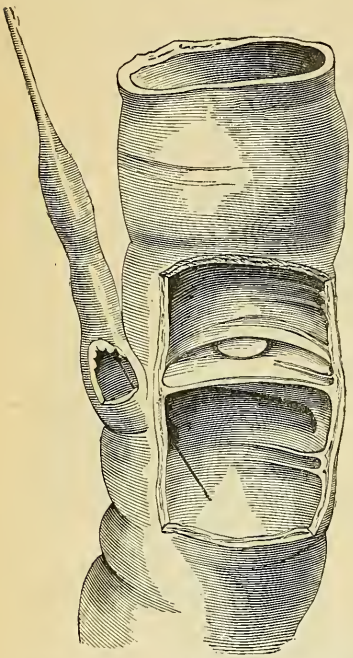

Fig. 205.—Ileum with a persistent vitello-intestinal duct associated with a valve. (*Museum, Middlesex Hospital.*)

An imperforate ileum is, of course, incompatible with life, but an individual with a septate ileum may attain adult life. The consideration of imperforate ileum has been introduced here because it throws a large amount of side-light on pharyngeal diverticula and imperforate pharynx.

Treatment. — The small pedunculated cysts and polypi of the umbilicus only require the application of a thread or silk ligature to the pedicle and a snip with a pair of scissors. Sessile cysts require to be dissected out. The grosser malformations, such as imperforate and septate ileum, have in a few instances been submitted to surgical treatment, but the efforts have not been successful.

Allantoic (Urachus) Cysts.—The urinary bladder of man in common with that of mammals generally presents at its apex an impervious cord that passes to the umbilicus. This cord is known as the **urachus**. At birth the urachus is usually traversed by a narrow canal lined with epithelium directly continuous with that lining the bladder.

* *British Medical Journal*, 1891, vol. i., p. 342.

The urinary bladder with the urachus is the persistent portion of the allantois, the organ which in the early embryo conveys blood-vessels from the aorta to the developing placenta. In the adult the urachus lies in the subperitoneal tissue exactly in the middle line of the anterior abdominal wall, between the summit of the bladder and the umbilicus. When the urachus becomes dilated it forms a cyst lying outside the peritoneum and in close relation with the bladder.

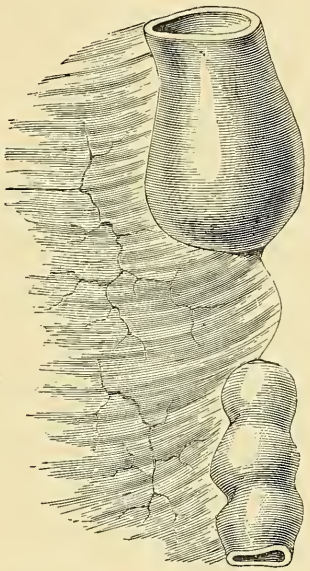

Fig. 206.—Imperforate ileum. (*Museum, Middlesex Hospital.*)

Instead of a portion of the allantois narrowing to form a urachus, the whole of its intra-abdominal portion may dilate and form a large urinary bladder. Shattock* has carefully described an example of this.

Several cases are known in which the umbilical end of the urachus has remained patent so that urine was voided at this spot. A urinary calculus has been extracted from such a persistent urachus.†

Allantoic cysts arise from dilatation of a urachus which is

* Trans. Path. Soc., vol. xxxix., p. 185.

† Thomas Paget, Med.-Chir. Trans., vol. xxxiii., p. 293, and vol. xliv., p. 13.

occluded at the umbilicus and at the summit of the bladder. Such cysts are usually of the size of a ripe cherry. Sometimes several very small dilatations are formed, causing the urachus to assume a moniliform appearance.

In rarer cases the urachus may dilate into a cyst as large as a distended bladder. The structure of these large cysts is identical with that of the bladder, and consists of unstriped muscle fibre, lined on the inner side with epithelium similar to that covering the vesical mucous membrane. In some of the specimens phosphates are deposited on the cyst-wall. In large cysts there is, as a rule, a communication with the bladder, and the cyst contains urine. A urachus cyst must not be confounded with a sacculus at the apex of the bladder extending into the suspensory ligament.

Lawson Tait* has published details of allantoic (urachus) cysts that have attained large dimensions; in one case the cyst had a capacity of ten pints. These cysts were situated between the peritoneum and the anterior abdominal wall.

Allantoic cysts have been observed in many mammals, such as the pig, horse, ox, mole, etc.

Treatment.—In a few instances large allantoic cysts have been removed and some of the patients have survived. At present so little is known about the cysts that it is impossible to decide as to the best method of dealing with them.

* *The Brit. Gyn. Journal*, vol. ii. 328; Wutz, "Ueber Urachus und Urachuscysten"; Virchow's "Archiv," bd. xcii. 387.

CHAPTER XLIV.

TUBULO-CYSTS *(concluded)*.

CYSTIC TUMOURS ASSOCIATED WITH REMNANTS OF THE MESONEPHROS (WOLFFIAN BODY), ITS TUBULES AND DUCT.

It is well established that in the embryo the mesonephros is closely associated with three organs, the testis, ovary, and kidney. It is also a fact that in at least two situations—viz., in the ovary and in the testis—remnants of the glandular elements of the mesonephros may be occasionally met with in the adult. Many of the tubules of the mesonephros and its duct function in the male as excretory ducts for the testis, but in the female they persist in a vestigial condition, as the parovarium and Gartner's duct.

There is abundant evidence for the belief that many cysts connected with the testis, ovary, parovarium, and vagina arise from vestiges of the mesonephros and its excretory canals. It will be convenient to begin the description of these cystic conditions by considering those which arise in vestiges of the glandular portion of the mesonephros in the **female**.

Cysts of the Paroöphoron.—The ovary consists of two parts, the oöphoron and the paroöphoron. The egg-bearing portion is the oöphoron. The paroöphoron contains no ova, but receives the tubules of the parovarium. (Fig. 207.) It represents the remnants of the mesonephros, and is homologous with the paradidymis of the testis. In the adult ovary the paroöphoron consists mainly of fibrous tissue permeated with blood-vessels, but in the fœtus and young child it retains, in a measure, its glandular character.

The paroöphoron is the probable source of cysts that present peculiar characters. In the early stages they resemble parovarian cysts in their relation to the mesosalpinx and Fallopian tube, but as they increase in size they burrow deeply between the layers of the broad ligament, and make their way by the side of the uterus, travel under the peritoneum, and strip it from the floor of the pelvis. When large, these cysts will come into contact with the common iliac veins at the brim of the pelvis, or they may raise up the anterior layer of the

broad ligament so as to invade the subserous tract of the anterior abdominal wall.

In addition to their burrowing tendencies these cysts are peculiar in that their inner walls are papillomatous. The number of warts varies in different cysts. Some have only a small cluster; in others the clumps are so large and so numerous that the cyst-wall bursts from the pressure exercised by them. The warts are usually very vascular, bleed freely when handled, and are frequently calcified. When

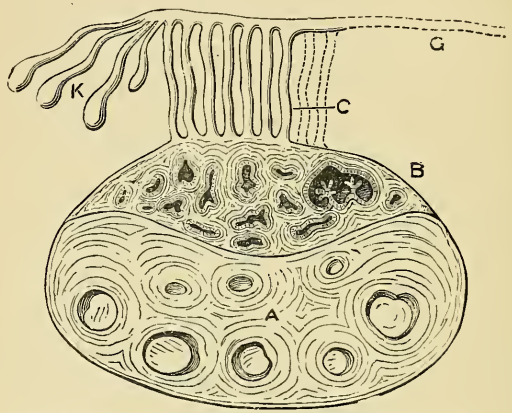

Fig. 207.—Diagram to represent the cyst regions of the ovary. A, oöphoron; B, paro-öphoron; C, parovarium; K, Kobelt's tubes; G, Gartner's duct.

a papillomatous cyst ruptures, the cell-laden fluid it contains is dispersed throughout the belly, and it frequently happens that the cells become engrafted upon the peritoneum and grow into warts. In such cases the warts are usually most numerous on the peritoneum in the recto-vaginal pouch. Exceptionally, the cyst will rupture into the connective tissue of the broad ligament, and warts sometimes spring up in this tissue, and I have seen them clustering around the urachus as high as the umbilicus. Occasionally the warts may make their way through the cyst-wall and protrude as in Fig. 208. Such emancipated warts grow luxuriously, and the movements of adjacent coils of intestine detach the surface cells and spread them about the belly. It frequently happens that surgeons are alarmed when they find warts on the peritoneum, as they mistake them for nodules of cancer or sarcoma. There

is, however, no cause for alarm, as the warts quickly disappear after removal of the primary tumours. In this respect these warts agree with those which grow on the skin (*see* page 168). Skin warts often appear suddenly, and almost as suddenly disappear. Thus the life of a wart is often very transient. So with peritoneal warts; but as long as the seed supply continues new warts spring up, last for a time and die, to be

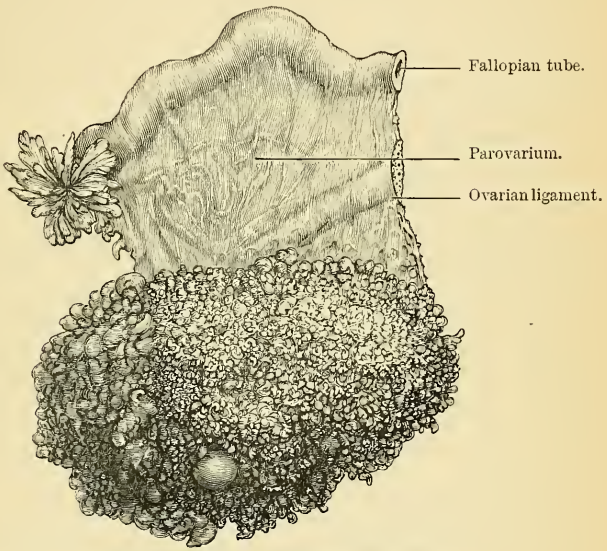

Fig. 208.—Ruptured papillomatous (paroöphoritic) cysts of the ovary. (½.)

succeeded in their turn by a new crop. When the tumours are removed the supply of germ epithelium ceases, the warts die, and the crop is not renewed.

Paroöphoritic cysts may be unilocular or multilocular; some attain great proportions, but the infective qualities of the cysts are in no way influenced by their size.

These cysts are rare before the twenty-fifth year. The period of life in which they are most common is between the twenty-fifth and fiftieth years. Coblenz* was probably the first to distinguish them clearly from parovarian cysts, and to associate them with definite structures. His observations have

* Virchow's "Archiv," bd. lxxxiv., 26.

been confirmed by Doran* and myself† by investigations on the ovaries of fœtuses and infants.

Although one of the distinguishing features of a paroöphoritic cyst is the presence of papillomata, it must not be imagined that all wart-containing cysts of, or near, the ovary arise in the paroöphoron. Undoubted parovarian cysts sometimes contain warts, and there is a species of cyst occasionally met with in the mesosalpinx in relation with the tubo-ovarian ligament which often contains warts. Every projection in a cyst is not a wart. In many oöphoritic cysts the microscope has shown that some wart-like structures are clusters of glands.

Parovarian Cysts.—The **parovarium** consists of a number of narrow tubules situated between the layers of the mesosalpinx. It is easily seen, when the mesosalpinx is stretched and held between the eye and a light, as a series of narrow tubules radiating from the ovary to join a longitudinal tubule situated at a right angle to them. In form and disposition these tubules resemble the vasa efferentia of the testis. The parovarium and the vasa efferentia are homologous structures, for they are the persistent tubules of the mesonephros (Wolffian body). That portion of the ovary into which they dip, the paroöphoron, is derived from the glandular portion of the mesonephros.

The parovarium in its typical condition consists of three parts:—(1) An outer series, free at one extremity, and known as Kobelt's tubes. (2) An inner set formed of about twelve tubules; these are often referred to as the vertical tubules. (3) A straight tube running at right angles, and occasionally traceable through the broad ligament to the vagina; this is Gartner's duct; it is homologous with the vas deferens of the male (Fig. 207).

The cysts that arise in the parovarium are of two kinds. Small pedunculated cysts often form in Kobelt's tubes; they rarely exceed a currant in size, and do not call for comment, as they are of no clinical importance. These cysts are very frequently mistaken for the hydatid of Morgagni, which, when present, hangs from a fimbria of the tube. The

* Trans. Path. Soc., vol. xxxii., 147.

† *Journal of Anatomy and Physiology*, vol. xx., 432.

important cysts arise from the vertical tubules, and separate the layers of the mesosalpinx, and burrow towards the Fallopian tube.

When small, parovarian cysts are transparent, and have very thin walls, but after they attain the size of a cocoa-nut the walls become thick, and the mesosalpinx in relation with the cyst becomes thickened, and sometimes the muscle fibre contained in this part of the broad ligament becomes greatly increased. Parovarian cysts sometimes attain a great size. I removed one that had a capacity of four gallons and a half.

Small parovarian cysts are lined with columnar epithelium which is ciliated in some specimens. In large cysts it becomes stratified, and in very big cysts it atrophies.

The fluid in small cysts is limpid, slightly opalescent, sp. gr. 1002—1007, and contains a substance that forms a flocculent precipitate when the cyst is immersed in alcohol. In large cysts the fluid is usually turbid and sometimes contains cholesterine. The fluid is not harmful, for when parovarian cysts rupture into the peritoneal cavity the fluid is absorbed and excreted by the kidneys. After rupture the rent will heal and the cyst refill, and in some cases the cyst has burst and refilled many times without causing more than temporary inconvenience to the patient.

The cyst may rotate on its axis and twist its pedicle. This movement may even lead to complete detachment of the cyst. Exceptionally, parovarian cysts suppurate. Although these cysts occupy the mesosalpinx, they do not burrow between the layers of the broad ligament below the ovarian ligament, but rise up out of the pelvis. This accounts in a large measure for the safety with which they may be removed. Parovarian cysts are almost invariably unilocular. The chief features which distinguish a parovarian cyst from other cysts of the broad ligament and ovary are these :—

(1) It is easily shelled out from the mesosalpinx.
(2) The ovary may often be found attached to the side of the cyst.
(3) The Fallopian tube is stretched over the crown of the cyst, but never communicates with it. (Fig. 209.)

Before the sixteenth year the parovarium appears to be quiescent, but on the advent of puberty it seems to become

stimulated. A considerable proportion of cysts, generically classed as ovarian, removed between the seventeenth and twenty-fifth years, arise in the parovarium. There is no trustworthy record of a parovarian cyst being observed before the sixteenth year.

Cysts of Gartner's Duct.—It has already been mentioned in the description of the parovarium that the vertical tubules of this structure are received into a tube running at right angles to them. This tube when persistent throughout its course makes its way between the layers of the broad ligament and runs downwards on the uterus, to open into the

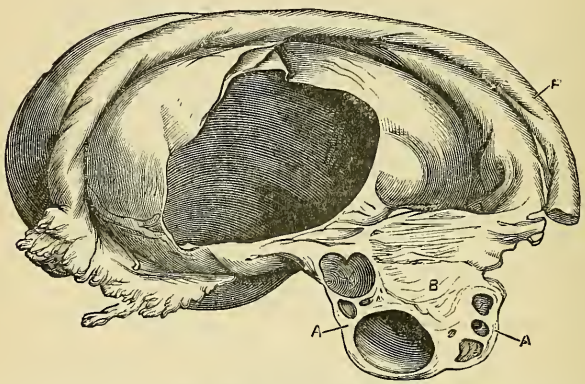

Fig. 209.—Cyst of the parovarium, showing its relation to ovary and tube. Two-thirds its natural size. A, oöphoron ; B, paroöphoron ; F, Fallopian tube.

vagina near the orifice of the urethra. This tube is known as Gartner's duct, and is the duct of the mesonephros (Wolffian duct), which in the male becomes the vas deferens. Gartner's ducts rarely persist throughout their whole extent in women. The portion that receives the tubules of the parovarium (Wolffian tubules) is often detected, and the terminal segment, known as Skene's tube, may be occasionally recognised in the vagina, and is frequently the seat of a troublesome inflammation. The intermediate segment, as a rule, disappears. In the sow, and especially in the cow, Gartner's ducts often persist ; in the cow they are sometimes seen as large as crow-quills. In many cows they become gradually lost on the sides of the uterus, but in some cases

they may be traced easily to their termination, and are found to open in the vagina.

The interest of Gartner's duct to the pathologist depends on the fact that the terminal segments are apt to become cyst-germs, and there is no doubt that some of the cysts that occasionally require removal from the vagina arise in Gartner's ducts, especially those which are lined with stratified epithelium. Such cysts have been known to attain the size of a fowl's egg, and are usually filled with mucus.

The evidence that some species of vaginal cysts arise in Gartner's duct is not merely circumstantial. A specimen that came under my notice in a cow is represented in Fig. 210, in which the vaginal segment of the duct expanded to form two large oval dilatations, each of which was large enough to accommodate a hen's egg. The specimen is preserved in the museum of the Royal College of Surgeons.

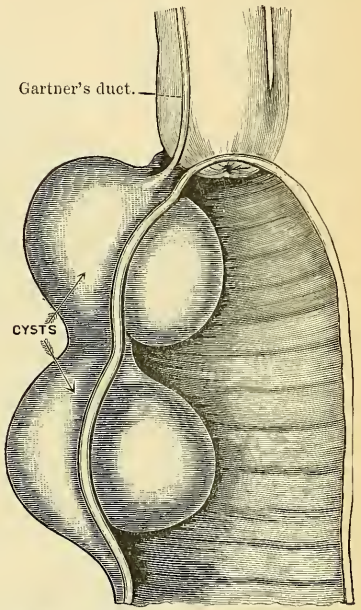

Fig. 210.—Anterior portion of a cow's vagina, showing two large cysts developed in the terminal segment of Gartner's duct.

In the **male,** cystic tumours that arise in the vestiges or remnants of the mesonephros (Wolffian body) and its tubules are of two kinds: (1) Encysted hydrocele of the testicle, and (2) general cystic disease of the testicle.

Encysted Hydrocele of the Testicle.—In addition to cysts arising in connection with the funicular pouch and its sub-divisions described in chap. xlv., there is another class termed "encysted hydroceles of the testicle."

In order to appreciate the nature of encysted hydroceles it will be necessary to consider a few points connected with the development of the testicle. This gland is very complex, for its

ducts, the vasa efferentia, epididymis, and vas deferens, were originally the excretory ducts of the mesonephros (Wolffian body). A study of the evolution of the male secretory organ of vertebrates indicates clearly enough that the ducts have undergone a change of function, and their relation to the testicle is secondary. An examination of the embryonic testis shows that remnants of the mesonephros persist among the

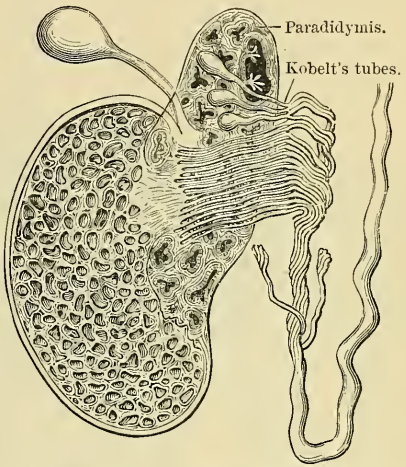

Fig. 211.—Diagram to show the relation of the mesonephros and its ducts to the adult testicle.

ducts, and only a few of the Wolffian tubules are utilised by the testicle.

The relation of the various embryonic structures to each other is shown somewhat diagrammatically in Fig. 211. In the adult testis it will be readily seen that a few of the Wolffian tubules become the vasa efferentia, the remainder usually atrophy; but in many individuals one, two, or more persist, usually as pedunculated cysts of small size at the top of the testicle.

The shrunken remains of the mesonephros (Wolffian body) sometimes persist as a collection of cæcal tubes furnished with epithelium, lying among the vasa efferentia, between the epididymis and the testis, and often extending a little distance into the tissues of the cord. These remnants are known as the paradidymis. Thus in the male the **mesonephros** is

represented by the paradidymis, its **tubules** by the vasa efferentia and Kobelt's tubes, and its **duct** by the epididymis and vas deferens.

The cysts to which the term encysted hydrocele of the testicle should be applied arise sometimes in the vasa efferentia of the testis and sometimes in Kobelt's tubes, and it is a

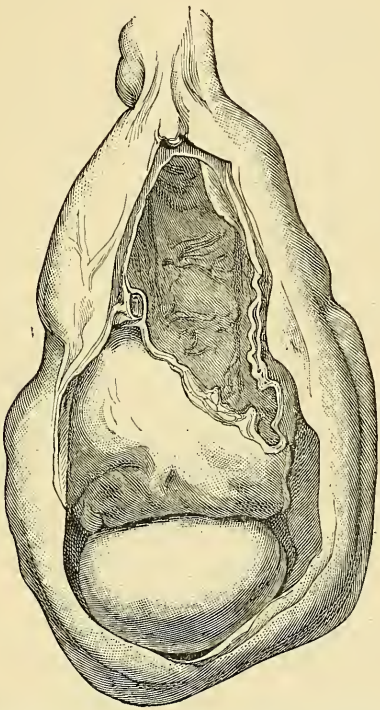

Fig. 212.—Hydrocele of the tunica vaginalis, and an encysted hydrocele associated with the same testis. (*Museum, Middlesex Hospital.*)

curious fact that these cysts arise in those structures which in the female give rise to parovarian cysts. As encysted hydroceles in the male and parovarian cysts in the female arise in homologous organs, these cysts are morphologically homologous. The anatomical characters of encysted hydrocele must now be considered.

These cysts are always closely associated with the testis, but lie outside its tunica vaginalis, but they may project into

the cavity of this sac. Occasionally a hydrocele of the tunica vaginalis is associated with an encysted hydrocele. (Fig. 212.)

When an encysted hydrocele is very large it may so overlap the testis that it is difficult to differentiate between it and a hydrocele of the tunica vaginalis, until actual dissection in the course of an operation shows that the cyst is independent of the tunica vaginalis.

The lining epithelium of these cysts may be of the stratified, cubical, columnar, or even of the ciliated variety; they contain fluid, which may be clear, or white like milk, due to the presence of fat; sometimes it contains spermatozoa. It may be blood-stained. In size these cysts vary greatly. As a rule, they do not exceed the dimensions of an egg, and often are much smaller; exceptionally, one of them may exceed a fist in size.

An encysted hydrocele must not be confounded with a cyst arising in an unobliterated funicular process.

In addition to the sessile form of encysted hydrocele of the testis, there is a pedunculated variety which is usually described as a supernumerary hydatid of Morgagni. These cysts rarely exceed a cherry in size and arise in Kobelt's tubules. As a rule, only one cyst is present, but two or three are not uncommon. Sometimes they will, like the hydatid of Morgagni, project into the cavity of the tunica vaginalis.

Our knowledge of the different species of hydrocele has become more definite since surgeons have followed the practice of dissecting out these cysts rather than trusting to the uncertain method, formerly so much in vogue, of injecting them with irritative and corrosive solutions.

Adenomata (General Cystic Disease) of the Testis.—The tumours of the testis that will be described under this heading are those to which Astley Cooper* gave the name of "hydatid disease." They were made the subject of careful study by Curling,† who designated the condition, "general cystic disease of the testis."

The morphology of these tumours has been investigated

* "Diseases of the Testis, 1830."

† Med.-Chir. Trans., vol. xxxvi. 449.

independently by Eve* and myself.† We find good evidence that they originate in the remnant of the mesonephros (Wolffian body) which lies between the globus major of the epididymis and the testis proper. This remnant of the mesonephros is known as the paradidymis. (Fig 211.) It often presents, as has already been mentioned, a distinctly glandular structure.

Testicular adenomata in their typical condition are made up of large numbers of cystic spaces. These cavities vary greatly in size; some are no larger than rape-seed, others may attain the size of a cob-nut. Many are distinctly tubular, and the cysts may communicate with each other. The loculi are lined with regular columnar, cubical, or stratified epithelium, and intracystic papillomata are not uncommon. The connective-tissue frame-work of the tumour consists mainly of simple fibrous tissue, but it may be so abundant as to form the bulk of the tumour, the cysts being sparse. In some of the specimens, especially those met with in infants, plain muscle fibre has been detected.

In at least one instance hair has been detected in the loculi of a testicular adenoma.‡ Many of these tumours have been described as cystic sarcomata, cystic fibromata, myxomata, etc.—all unfortunate names. In size they vary greatly; specimens are known as large as melons. The best examples for investigation are those which do not exceed the size of an egg. In these the relation of the tumour to the testicular structures is very instructive. As the tumour increases in size it flattens the body of the testicle until it is reduced to a narrow stratum intervening between the tunica vaginalis and the adenoma. (Fig. 213.) In the large specimens it is often difficult to detect any remnant of the testicle.

Testicular adenomata have been observed within a few months of birth and as late as the fortieth year.

In all strictness testicular adenomata should have been described in chap. xxvi.; but as they are so closely related to the vestiges of the mesonephros, it was more convenient to describe them in this chapter.

* Trans. Path. Soc., vol. xxxviii. 201.

† *Lancet*, 1887, vol. i. 254.

‡ D'Arcy Power, Trans. Path. Soc., vol. xxxviii. 224.

Treatment.—The most satisfactory method of dealing with paroöphoritic and parovarian cysts is prompt removal. **Parovarian cysts** are the simplest and most satisfactory cysts with which surgeons have to deal; they rarely contract adhesion and are almost always unilocular.

Paroöphoritic cysts stand in striking contrast to those which arise in the parovarium, for they burrow deeply beneath

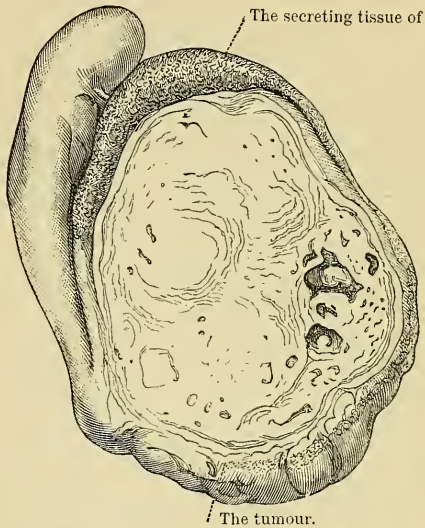

Fig. 213.—Testicular adenoma. (*Museum, St. Mary's Hospital.*)

the pelvic peritoneum and give rise to great difficulty in consequence of the close proximity of such structures as the ureter, iliac arteries and veins, and the inferior vena cava. When small they are sometimes removed as easily as parovarian cysts, but when large, and they have burrowed deeply, the process of enucleation is both difficult and dangerous. The presence of an abundant crop of warts, or hydroperitoneum should not deter the surgeon from removing a paroöphoritic cyst, as the exudation of fluid will cease and the warts disappear when the cyst is removed.

Cysts in the **vagina** due to **vestiges of Gartner's duct** should be completely dissected out. When the cyst is large the surgeon must be prepared for a delicate and deep dissection that may lead him very close to the bladder in front,

the ureter at the side, the rectum behind and the peritoneum above. It is absolutely necessary to dissect out the whole of the cyst. Measures short of this are useless.

The most satisfactory method of treating **encysted hydrocele of the testis** is to expose the cyst through an incision in the scrotum, tap the cyst, and then enucleate its walls, taking care not to damage the testis or the vas deferens. The cavity is then drained and allowed to close by granulations.

Such procedures as tapping and the injection of irritating fluid are troublesome, inconvenient, and often end in disappointment. The method of incising the cyst and stitching its edges to the skin and allowing the sac to granulate is practised by a few surgeons: it is slow and unsatisfactory when compared with radical extirpation of the sac.

There are no signs that enable a surgeon to diagnose with certainty a testicular adenoma: it has been confounded with hæmatocele, tubercular disease, and sarcoma. The appropriate treatment is castration.

Cysts of Müller's Ducts.—In many vertebrata the eggs, after their escape from the ovary, are conveyed to the exterior by means of a muscular conduit known as the oviduct. The general disposition of these ducts, for there are usually two, may be gathered from an examination of a female frog or toad. The ducts extend from the cloaca posteriorly to the roots of the lungs anteriorly; they are supported on the dorsal wall of the abdomen by means of a delicate fold of peritoneum, and each duct communicates with the peritoneal cavity by a dilated orifice known as the infundibulum. In the breeding season the ducts become greatly enlarged and convoluted, resembling coils of small intestine.

Normally, oviducts are present in the female only. It is, however, remarkable that the embryos of those forms in which the sexes are distinct in the adult condition, have the rudiments of the sexual organs peculiar to the male and female; they are hermaphrodite. As development continues one set of organs usually attains a functional condition; the other atrophies more or less completely.

The distinguishing features of the internal sexual organs of a female frog are two ovaries and two oviducts. In the male the oviducts are usually absent. It is, however, an interesting fact that in many male frogs the oviducts may be detected as thin, delicate threads ascending in the peritoneum from the structures called vesiculæ seminales to the roots of the lungs. Sometimes the ducts are of large size, almost equal to the oviducts in the female. Persistent Müllerian ducts are more common in male toads than in frogs. Often they are associated with the malformation of the genital gland known as an ovo-testis; but they are fairly

frequent even when the genital gland is a typical testis. No one can doubt that an oviduct in a male frog or toad is functionless, and it is not uncommon to meet with small dilatations or cysts lying in the track of, and arising from, the functionless oviducts. Persistent Müller's ducts are by no means confined to batrachians, but they have been observed in fish, lizards, stallions, birds, and men.

Good examples of cysts arising in functionless ducts are sometimes met with in birds. In birds, as in frogs and toads, the eggs are conveyed to the exterior by means of an oviduct, but in the case of birds the duct is functional on the left side only. Each chick has two oviducts, but the right ovary and duct, from some unexplained cause, atrophies, leaving, as a rule, a small, narrow tubule surmounted by a lobule of fat. This remnant of the right duct is very apt to dilate and form a cyst. When the stump of the duct is longer than usual it will sometimes become unequally dilated and form a chaplet of cysts.

CHAPTER XLV.

HYDROCELE.

The name **hydrocele** is applied to several different kinds of cystic tumours, and as the name is so deeply rooted in surgical literature it would be very inconvenient to attempt to discard it. It will be used in this work in a generic sense, and will include the following species:—(1) Hydrocele of the tunica vaginalis; (2) Hydrocele of the canal of Nuck; (3) Ovarian hydrocele.

(1) **Hydrocele of the Tunica Vaginalis.**—Each testicle is preceded in its descent by a diverticulum of the parietal peritoneum, which enters the scrotum by way of the inguinal canal. As the testicle descends behind this diverticulum, or **funicular pouch** as it is termed, it invaginates the membrane in such a way as to invest the anterior two-thirds of its surface with a double layer of peritoneum. When the testicle first gains the scrotum the funicular pouch is in free communication with the general peritoneal cavity. It is a remarkable fact that in almost every mammal, male and female, save man, this relation of the funicular pouch to the peritoneal cavity persists throughout life.

In exceptional instances this communication persists even in man, but in him it is distinctly abnormal. Normally the peritoneum becomes adherent immediately above the testis, this adhesion dividing the pouch into two parts; that in relation to the testis persists throughout life as the **tunica vaginalis**, whilst that above the testis usually undergoes obliteration in the course of the early months of infant life. Occasionally, occlusion of this pouch is delayed for some years, and in rarer cases it may persist throughout life.

Normally, the only portion of the funicular pouch that persists throughout life is that which is in immediate relation with the testis—the tunica vaginalis—and when this becomes distended with fluid it is termed *hydrocele* of the *tunica vaginalis*. When containing blood it is called *hæmatocele* of the *tunica vaginalis*. Should the whole of the funicular pouch persist and become occupied by fluid,

it is called a *congenital hydrocele.* Frequently the tunica vaginalis is formed as usual, but the portion intervening between it and the internal abdominal ring persists, and may become distended with fluid. This is known as *funicular hydrocele;* it is often called *encysted hydrocele of the cord.*

Hydrocele of the Tunica Vaginalis appears in two forms, **acute** and **chronic.** Acute hydrocele is due to inflammatory effusion into the sac, either as the result of injury or secondary to acute orchitis. This is the rarer form and, as a rule, the fluid is absorbed and the parts return to their normal condition as the inflammatory trouble that caused it subsides. Exceptionally, a hydrocele appearing in this way persists.

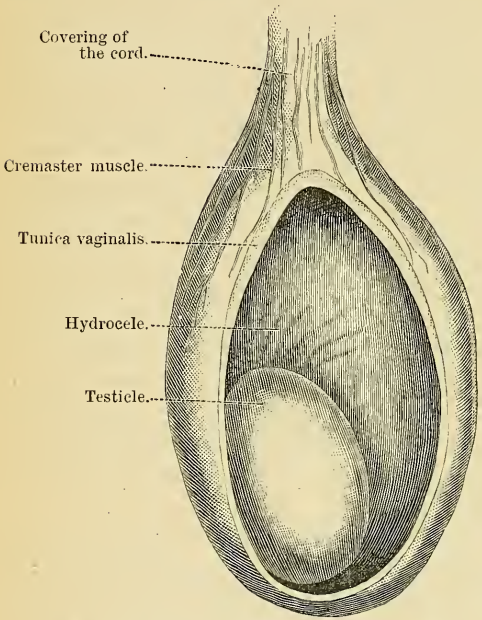

Fig. 214.—Hydrocele of the tunica vaginalis testis.

The common form of hydrocele is a passive effusion into the tunica vaginalis, usually appearing about the middle period of life, and in most cases without any exciting cause, either local or constitutional. It is very common in men who have lived in the tropics. This form of hydrocele is not infrequent in infants, but as a rule, quickly disappears. Hydrocele is met with in extreme old age, and is occasionally bilateral.

The amount of fluid in hydroceles varies greatly; in some it amounts to one or two ounces, whilst in others it measures a pint or more. It is related of Gibbon the historian, that he had a hydrocele which Cline tapped and from which six quarts of fluid were drawn off. (*Erichsen.*)

The fluid when withdrawn from a hydrocele is limpid, of a

straw colour, with a sp. gr. of about 1015. It contains a large amount of albumen and the substance known as fibrinogen. When allowed to stand after withdrawal it spontaneously coagulates.

When the fluid is removed by tapping, it usually quickly reaccumulates, so that the amount of fluid furnished by a large hydrocele in the course of a few years is often considerable. Even the withdrawal of large quantities of fluid from a hydrocele at frequent intervals seems to exercise no evil influence upon the health of the patient.

The presence of a large quantity of fluid in the tunica vaginalis leads to changes, not only in the membrane itself, but also in the testicle, for this gland, pressed upon by the fluid, will in course of time atrophy. In most specimens the testis is situated in the lower and back part of the sac, as in Fig. 214. In those cases in which the testis is inverted the hydrocele projects posteriorly, and the testis lies in front and at the upper part of the sac.

In addition to atrophy of the testis, the diminution in the size of its secreting tissue may be masked by great thickening of its tunica albuginea, a condition termed periorchitis, which is by no means infrequent in old hydroceles, especially those which have been repeatedly tapped. This thickening, or sclerosis, manifested by the immediate covering of the testis is often seen in the tunica vaginalis throughout its whole extent, and in some cases this membrane may be as thick and almost as hard as paste-board. The hardness of these thick sacs is sometimes increased by calcareous matter. When such sacs are dissected out they are not unlike a cocoa-nut in shape, size, and even in consistence. Secondary changes of this kind may be due to repeated attacks of inflammation set up by tapping. A slight degree of inflammation following this slight operation may be useful, as it may induce adhesion of the serous surfaces and lead to obliteration of the sac. This, however, is rarely complete. In some cases bands of adhesions or broad septa form and produce a loculated cyst. In other cases suppuration ensues which may lead to serious consequences. Occasionally, loose bodies are found in the sac of the tunica vaginalis, often associated with, but sometimes independent of, hydroceles. Some are no larger than the

head of a pin others attain the dimensions of a cherry. The larger examples consist of dense structureless laminæ.

The variety known as **Congenital Hydrocele** is due to the persistence of the funicular pouch throughout its whole extent. In this form we meet with two conditions—viz., the sac may retain its connection with the general peritoneal cavity, or it may be occluded at the internal abdominal ring. When the orifice of the sac is not occluded, the fluid that accumulates in the sac gravitates into it from the peritoneal cavity during the day; but during the night, when the body has been in a recumbent position for a prolonged period, the fluid returns wholly or in part into the abdomen, so that in the morning the scrotal swelling will be found greatly diminished, if not entirely gone. As the day goes on the fluid will slowly reaccumulate in the tunica vaginalis. This alteration in size of the swelling is characteristic of this variety of hydrocele; but it is sometimes simulated by, and mistaken for, inguinal hernia.

When the funicular pouch is shut off at the inguinal canal and becomes distended with fluid it is difficult to distinguish it, except by dissection, from a hydrocele of the tunica vaginalis.

Congenital hydrocele is most commonly met with in children, and is very rare after the fifteenth year.

Funicular Hydrocele is another variety frequently referred to as encysted hydrocele of the cord. It is due to effusion of fluid into that portion of the funicular pouch which intervenes between the tunica vaginalis and the internal abdominal ring, and which, under normal conditions, suffers obliteration. This form of hydrocele is very frequent in infants, and presents itself as an ovoid tumour lying between the testis and the inguinal canal. Although it possesses very characteristic features, this variety of hydrocele is frequently confounded with hernia of the intestines into the funicular pouch. Funicular hydroceles occasionally occur in young adults.

It should be borne in mind that an inguinal hernia may be associated with a hydrocele, and it happens very rarely that the neck of a hernial sac may become so narrowed that gut and omentum no longer pass through it. A pouch of this kind would, if distended with fluid, simulate a hydrocele

of the tunica vaginalis. In exceptional cases, **hydrocele of a hernial sac** accompanies ascites. In several instances collections of ascitic fluid have been evacuated through trocars inserted into the sac of an old hernia.

(2) **Hydrocele of the Canal of Nuck.**—In female fœtuses a diverticulum of the parietal peritoneum descends into the inguinal canal, and is in all respects identical with the funicular pouch in the male, and is known as the canal of Nuck. Usually this pouch becomes obliterated, but it is by no means rare to find it patent in young females. Occasionally the canal becomes distended with fluid and forms a cyst occupying the inguinal canal, and is then termed a hydrocele of the canal of Nuck.

Treatment of Hydroceles.—The routine practice of treating hydroceles is to draw off the fluid by means of a narrow trocar and cannula. The cyst almost invariably refills, necessitating repeated tapping. To remedy this, various plans, such as injecting the sac with tincture of iodine, carbolic acid, and good port wine, have been employed. Some surgeons incise the sac and stuff it, permitting the walls to granulate. The most satisfactory method is to expose the tunica vaginalis and dissect it away. I have practised this radical method on patients as young as fifteen months and as old as eighty-three years. It is the most satisfactory and successful of all methods, and is safer than the uncertain plan of injecting irritating fluids into the sac.

(3) **Ovarian Hydrocele.**—The ovaries in rats and mice are contained within a serous sac derived from the peritoneum. The abdominal ostium of the Fallopian tube communicates with the ovarian sac; hence when the ova escape from the ovary they enter the Fallopian tube and gain the uterus without entering the general peritoneal cavity, as is the case with the human ovum. This serous sac investment of the ovary reminds us of the tunica vaginalis of the testicle, and like it the ovarian sac is liable to become distended with serous fluid, a condition to which I have applied the name **ovarian hydrocele.** Cysts of this kind in rats may attain a large size, and their general features are well illustrated in Fig. 215. The Fallopian tube in the rat is coiled up between the cornu of the uterus and the ovarian sac, but when the sac becomes

distended it uncoils the tube and stretches it around the circumference of the cyst; the tubal ostium opens on the inner wall of the hydrocele, and the adjacent section of the tube is, as a rule, dilated. The ovary, when the cyst is small, projects into the cyst, but in very large hydroceles it atrophies from pressure. As the ovarian sac is in communication with the uterine cornu it sometimes becomes implicated in septic conditions of the uterus, and the sac is sometimes found distended with pus.

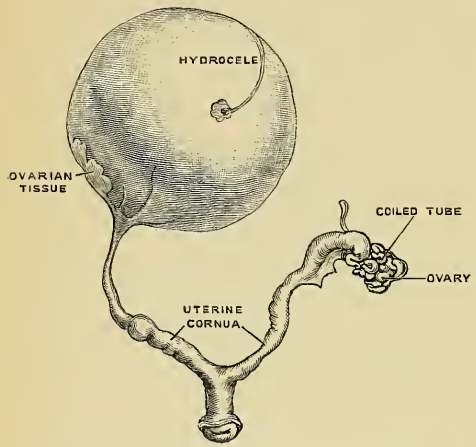

Fig. 215.—Ovarian hydrocele in a rat. (*Nat. size.*)

No mammal normally possesses such a complete ovarian sac as do rats and mice, but many have a pouch that communicates with the general peritoneal cavity by a small aperture; in others the pouch has a narrow slit; whilst in women the ovary, in its virgin condition, lies in a shallow recess. Notwithstanding the fact that the mouth of the ovarian pouch is in women very wide, there is good reason to believe that its edges may unite when the pouch is abnormally deep and convert it into a closed sac, which subsequently becomes a hydrocele. Ovarian hydroceles occur in the human female and sometimes attain a large size. They present the following anatomical features:—

The sac projects from, and is intimately connected with, the posterior layer of the broad ligament. In small hydroceles the ovary projects into the cavity of the cyst, but in large examples it is atrophied. The Fallopian tube lies on the crown of the cyst, its outer half is dilated and tortuous; the ostium opens into the hydrocele by a large circular or elliptical aperture. Ridges of mucous membrane issue from the interior of the tube and pass on to the walls of the hydrocele

in a radiating fashion. When the specimens are examined in a fresh state it is not rare to find the aperture fringed with tubal fimbriæ. The general appearance of a typical ovarian hydrocele suggests "a retort with a convoluted delivery-tube" (Griffith). In some of the specimens (Fig. 216) there appear

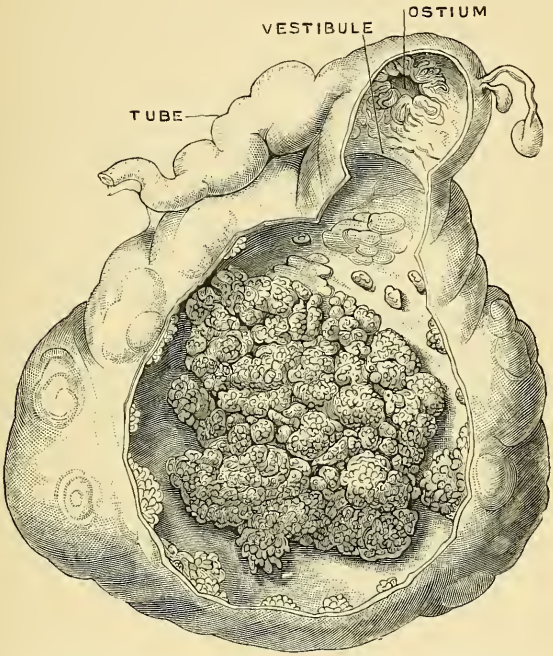

Fig. 216.—Ovarian hydrocele: the interior of the sac is beset with warts.

to be three parts:—(1) The dilated ampulla of the tube, which opens by its fringed ostium into (2) a vestibule, which opens into (3) the hydrocele proper. In women the hydrocele contains, as a rule, serous fluid, but it is easy to understand, considering its relations with the tube, that if the latter become septic the hydrocele would become filled with pus.

I have never been able to demonstrate an epithelial investment on the inner wall of an ovarian hydrocele, but warts may occur in great number. The ovary may be cystic and mask the nature of the specimen, and greater obscurity prevails when an ovary, associated with a hydrocele, contains a dermoid. Besides finding them in rats and women, I have

detected an ovarian hydrocele in a guinea-pig, and Schneidemühl has observed it in the mare.

The cysts liable to be confounded with ovarian hydroceles are parovarian cysts: small paroöphoritic cysts and large hydrosalpinges. A parovarian or paroöphoritic cyst is distinguished from a hydrocele of the ovary by the fact that the Fallopian tube is stretched across the cyst but does not communicate with its cavity.

In the case of a large hydrosalpinx the ampulla is often so flexed on the tube as to produce a retort-shaped cyst; but there are no fringes or ridges of the mucous membrane at the orifice of communication, and the ovary lies free of the cyst-wall and is often lodged in the flexure of the tube.

Ovarian hydroceles must not be confounded with tubo-ovarian cysts and abscesses the result of salpingitis.

Ovarian hydroceles demand careful study; they are often a source of difficulty in diagnosis, and their appearance is sometimes puzzling to beginners in abdominal surgery, and their successful removal occasionally an anxious proceeding.

CHAPTER XLVI.

CONGENITAL CYSTS (HYDROCELES) OF THE NECK AND AXILLA.

THE term "hydrocele of the neck" has been used in a generic sense for various congenital cysts occasionally found in the anterior and lateral regions of the neck. (Fig. 217.)

The term should be reserved for those congenital cysts with serous contents situated beneath the deep cervical fascia. These cysts present easily recognisable characters. They are always noticed at or immediately after birth; even at birth they are sometimes of very large size, and exhibit a preference for the anterior triangle, and in some instances extend into the axilla and superior mediastinum; sometimes they occupy the middle line of the neck, and occasionally project into the posterior triangle. Their upward limit is, as a rule, indicated by the hyoid bone, but they have been known to reach as high as the parotid gland. The cyst may be unilateral or bilateral; it may consist of a single cavity, or be multilocular, and the various chambers may intercommunicate. In size they vary greatly; some equal a fist, others are bigger than the head of the patient. When the walls of the cyst are thin and the overlying skin is stretched, the tumour is as translucent as a thin-walled hydrocele of the tunica vaginalis testis.

These cysts originate below the deep cervical fascia, but a portion may make its way through this membrane and become subcutaneous. The fact that these cysts always arise beneath the deep cervical fascia, gives colour to the view that they may be in some way related to the air-sacs which exist in this situation in many monkeys. In their anatomical relationship and the way they ramify among the big vessels at the root of the neck, cervical cysts in children and cervical air-sacs in monkeys are on all-fours.

It is possible, indeed very probable, that some of these congenital cysts of the neck arise as dilatations of lymphatics. On several occasions I have dissected fœtuses born at full-time with large subcutaneous cysts on the back and the abdomen filled with straw-coloured fluid, and in at least

one instance a cervical cyst has been associated with macroglossia.* Some of these cysts remind me of the large lymph-spaces beneath the skin of frogs.

Perhaps the most remarkable fact in connection with them is the tendency they exhibit to shrivel and disappear; they are exceptionally liable to inflame, and several cases have been recorded in which they have been burst by the children

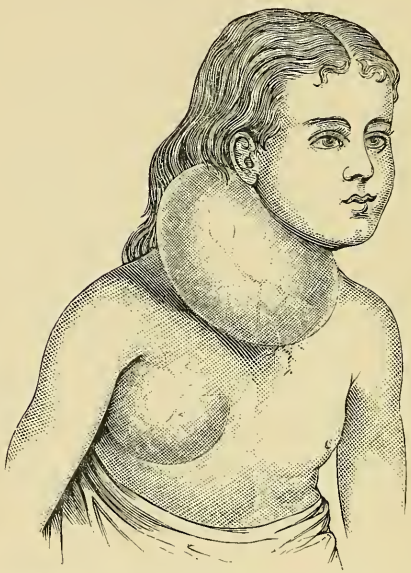

Fig. 217.—Congenital cervical cyst extending into the axilla. (*After T. Smith.*)

falling upon them. Their proneness to spontaneous cure explains the extreme rarity of these cysts after puberty. Attempts to cure them by tapping, injections, or setons are usually attended by grave danger; this is equally true when the surgeon tries to remove them, as the dissections are deep and tedious, and complete extirpation is sometimes impossible.

It has been many times observed that the spontaneous effacement of these cysts is preceded by a sudden increase in their size; they become hot, tender, and pass into a state of inflammation, and as this subsides the cysts slowly disappear.

* Maguire, *Journal of Anatomy and Physiology*, vol. xiv. 416.

Congenital cervical cysts do not always atrophy. Birkett* has recorded the details of a case in which one of these cysts was observed in the neck just above the clavicle soon after birth; it gradually increased in size and extended into the axilla. When the patient was three years of age the cyst was

Fig. 218.—Congenital cervical cyst in a man twenty years of age. (*After Birkett.*)

tapped and nine ounces of clear serum were withdrawn. Severe constitutional symptoms followed this procedure, the life of the patient being placed in great jeopardy. The child recovered and in a short time the cyst refilled. Mr. Birkett did not see this boy again until he was twenty years old. He then presented himself at Guy's Hospital with the tumour in the condition represented in Fig. 218, and as it caused the man

* Med.-Chir. Trans., vol. li., p. 185.

much inconvenience he was anxious to get rid of it. Attempts were made to cure the cyst by withdrawing the fluid by repeated tappings. In the course of seventeen days five punctures were made, and in all one hundred and eighty-one ounces of dark-brown serous fluid flowed out; but this treatment made no difference to the tumour, and as it seemed to affect the patient profoundly, it was deemed prudent not to resort to more active measures, and the man returned to his home.

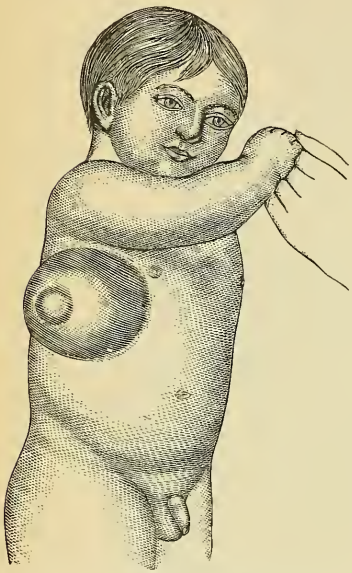

Fig. 219.—Congenital cyst of the thorax with nævoid walls. (*After Hutchinson.*)

It is necessary to point out that in some of these cervical cysts, as well as those which occur in the axilla—for cysts of this character are sometimes met with in the axilla unassociated with cervical cysts—the walls consist of tissue so vascular as to merit the term nævoid. In some of the cases that have been carefully observed and dissected, the tissue so strongly resembled erectile tissue that some writers have considered that these cysts should be regarded as nævi that have undergone cystic degeneration, and some have even ventured the opinion that they arise in the intercarotid body, a theory which Luschka regarded as probable. Julius Arnold * effectually disposed of this conjecture by publishing details of two cases which he dissected, in which he found in addition to the cyst an intercarotid body.

It is also necessary to point out that congenital cysts of this character are met with on the thorax, unassociated with cervical cysts (Fig. 219). Birkett, in the paper previously mentioned, has described two cases in which he enucleated

* Virchow's "Archiv," bd. xxxiii., s. 209.

a nævoid cyst from the axilla. Similar cysts have been observed and described by surgeons on the back and even on the limbs.

In concluding this account of congenital cervical and axillary cysts it is well to point out that some of them probably arise on the same plan as the laryngeal saccules of certain apes; a few may be due to secondary changes in nævi, and others may originate in the lymphatics.

Some of the smaller unilateral cysts confined to the neighbourhood of the sterno-mastoid are due to the distension of imperfectly obliterated branchial clefts. These are fully dealt with in chap. xxxv. Lastly, it must not be forgotten that typical dermoids, with skin, hair, and even teeth, are occasionally met with in the neck.

Laryngoceles.—In certain adult monkeys, particularly the chimpanzee (*Simia troglodytes*) the deep cervical fascia is undermined by diverticula from the laryngeal mucous membrane. This large sub-fascial air-chamber communicates with the larynx through the thyro-hyoid membrane; it extends downwards to within 2 cm. of the pre-sternum. Exceptionally it dips into the anterior mediastinum, and laterally into the arm-pits, the axillary fasciæ forming the lowest limits of the sac.

In one fine chimpanzee I injected this huge reservoir, and found it would hold three pints of injection mass. In the Howling monkeys (*Mycetes*) the air-sac is very large, and the basi-hyal is hollowed to form a resonance chamber. Cervical air-sacs exist in many mammals, and can be inflated at will. They arise as diverticula from the larynx, either from the ventricle, or from the pouch of Morgagni in the middle line of the larynx below the epiglottis. In the early stages the lateral pouch resembles the human sacculus laryngis inflated. Gradually the sacs undermine the deep cervical fascia and subsequently coalesce. The air-sac of the adult chimpanzee is formed by fusion of two lateral and a median pouch.

There is great variety in the degree of development of the cervical sacs in different genera and species of mammals.

In 1888 I stated the following reasons for regarding some

kinds of congenital cervical cysts in children as examples of laryngeal saccules :—

1. The congenital nature of the cysts. Repetitions of animal structures of this kind are always congenital.
2. Their relation to the hyoid bone and larynx. The hollow of the basi-hyal in man represents the large cavity in the basi-hyal of many mammals.
3. The situations of the cysts beneath the deep cervical fascia and their occasional extension into the axillæ.

Treatment.—It has already been mentioned that "hydroceles of the neck" very rarely require treatment, as they almost invariably shrivel and disappear spontaneously.

CHAPTER XLVII.

CYSTS OF THE SALIVARY GLANDS—RANULÆ—PANCREATIC CYSTS—DACRYOPS.

The term **ranula** is probably one of the oldest in surgery, and its etymology is not very obvious. Until recently it was applied to all cysts in the floor of the mouth, and as cysts in this situation are of various kinds and arise from different structures, it naturally followed that the term gradually came to possess merely a topographical significance. There is at the present time a strong tendency to restrict the name ranula to cysts arising in connection with the ducts of the three sets of salivary glands opening into the mouth, and to designate them as submaxillary, sublingual, or parotid ranulæ, according to the gland affected. If surgeons would use the term in this definite sense much unnecessary discussion would be saved.

In the majority of cases ranulæ are probably retention cysts due to obstruction of a duct. They are common in connection with the submaxillary and sublingual glands. The cysts are, as a rule, thin-walled, and lie in the furrow between the gum and the tongue and bulge upwards into the floor of the mouth. When large they cause a prominence in the submaxillary triangle. The cyst may be filled with saliva. Sometimes it contains mucus and a yellow substance resembling the yolk of an egg.

Occasionally the obstruction is caused by a calculus impacted in the orifice of the duct, but cases come under observation in which the duct is not completely obstructed, yet the fluid is retained. It is reasonable to believe that ranulæ sometimes arise independently of obstruction to the main duct, and, as in the case of pancreatic so-called ranulæ, observation supports the view that there is, in all probability, a pathological cause apart from mere obstruction concerned in their production.

Parotid ranulæ are rare in the human subject, but they have been observed in calves, oxen, and horses.

Submaxillary and sublingual ranulæ occasionally follow amputation of the tongue, due, no doubt, to injury of the duct or its implication in cicatricial tissue.

Much needless discussion has taken place in regard to the sources of ranulæ, because the various writers seem to forget that, in addition to salivary glands, there are mucous glands, and one of variable size near the tip of the tongue known as Nuhn's gland. Any of these may dilate into a cyst. Still further to complicate the diagnosis, dermoid cysts not infrequently arise in the floor of the mouth near the frænum of the tongue or deeply in its substance (*see* page 308). It has also been urged as an objection to the view that ranulæ arise in the ducts of the salivary glands, that the fluid they contain is not always saliva. This is very weak argument. Many hydronephrotic cysts contain fluid which it would be difficult to regard as urine, and an obstructed gall bladder is sometimes filled with fluid that does not possess a single attribute of bile. So a cyst arising in connection with a salivary gland will sometimes contain fluid that fails to furnish the characteristic reactions of saliva.

Treatment.—The method of treating a ranula consists in excising a portion of the wall of the sac, evacuating the contents, stuffing the cyst, and allowing it to granulate. It is, however, much more satisfactory to dissect out the whole of the cyst. This is an insurance against its return, and, as surgical wounds of the mouth heal rapidly, recovery after complete extirpation of the cyst is quicker and more complete than when the sac is left to obliterate by granulation.

Pancreatic Cysts.—It has long been known that the duct of the pancreas is liable to become dilated, and as the condition is analogous to the distension of the ducts of the buccal salivary glands, dilatation of the pancreatic duct (canal of Wirsung) is sometimes referred to as a "pancreatic ranula."

Virchow recognised two varieties of pancreatic ranula. In one variety the canal is dilated irregularly throughout its whole extent, so that it assumes the appearance of a chaplet of cysts; in the other the duct is dilated immediately behind its terminal orifice. Such cysts, he writes, may attain the size of a fist, and are consecutive to cicatricial contractions and compression by tumours. The cysts are not filled simply with

pancreatic secretion, for when the cysts attain a certain size they will be found to contain mucoid material, products of hæmorrhages, and, not rarely, calculi. Judging from what is known of retention cysts in general it would, as a matter of simple inference, be thought that pancreatic ranulæ arise from partial obstruction to the pancreatic duct, either from impaction of a pancreatic calculus in the terminal segment of the duct, a gall-stone lodged at the duodenal orifice, or a tumour arising in connection with the ducts or tissues, in the immediate neighbourhood. This, however, does not appear to be the case, for pancreatic ranulæ have been observed and no obstruction has been detected by the most careful dissection. Besides this, the duct of the pancreas has been found completely obstructed by a calculus, and the gland, instead of being converted into a cyst, has been found atrophied, its secreting elements being largely replaced by fibrous tissue.

Experimental evidence also supports this conclusion, for it has been demonstrated that when the pancreatic duct is occluded during life by a ligature the gland does not become cystic, but atrophies. Thus experimental and clinical evidence indicates that pancreatic cysts are the result of pathological changes which may, or may not, be associated with obstruction of the duct.

A great deal of attention has, during the past ten years, been devoted to pancreatic cysts in their clinical as well as their pathological aspect, and certainly the evidence indicates that other causes than obstruction, partial or complete, are responsible for their production.

Cysts described as pancreatic sometimes attain very large proportions, and examples have been reported with a capacity of two gallons or more. These very big cysts form smooth globular swellings in the upper part of the belly. They lie behind the peritoneum, and of course, have the stomach and transverse colon in front; when very large these cysts will extend some distance below the transverse colon.

The fluid contained in large pancreatic cysts is usually turbid. Sometimes it is white or even opalescent, occasionally it is clear, and in some cysts it will have a brown or even a green tint. The specific gravity varies between 1010 and 1020, and there is a small trace of albumen. Mucin is often

present, also tyrosin and blood pigment; and traces of urea have been detected. The fluid is sometimes capable of emulsifying fats.

The modes by which very large pancreatic cysts arise is not by any means clear, but it is important to bear in mind that there is, in a very significant proportion of cases, a definite history of antecedent injury. This fact gives colour to the suggestion that some of the cysts are due primarily to laceration of the pancreas and subsequent extravasation of its secretion behind the peritoneum. Another very important feature of these cysts is the liability to hæmorrhage, and this may take place so abundantly into the cyst as to jeopardise the life of the patient; indeed in some cases it has been fatal.

Pancreatic cysts occur at almost all periods of life. Examples have been reported as early as the eighth year of life and as late as the seventy-third. They appear to be most frequent in men, but a number of cases have been reported in women.

Pancreatic cysts attributed to injury have followed a variety of accidents, such as falls from a great height, followed by abdominal pain; a crush of the abdomen between the buffers of railway waggons; fall from a horse, or from a vehicle; kicks from men, and in several cases from horses.

Jordan Lloyd* has attempted to show that the large pancreatic cysts that follow injury to the abdomen are really collections of fluid in the cavity of the lesser omentum, and when the fluid has the property of rapidly converting starch into sugar it may be assumed that the pancreas has been injured. He also points out that the characteristic feature of so-called pancreatic cysts—viz., a swelling occupying the epigastric, umbilical, and left hypochondriac regions—is precisely that which would result from distension of the lesser bag of the peritoneum. It is probable that some cases of supposed pancreatic cysts were really effusions into the lesser bag of the peritoneum, for undoubted examples of distension of this cavity with fluid have been observed, dissected, and described.

* *Brit. Med. Journal*, 1892, vol. ii. 1051.

Treatment.—The method of treatment that gives best results is to expose the cyst through an abdominal incision, and, after emptying the cyst, stitch its cut edges to the margins of the wound in the belly-wall and drain; it is also desirable to make a counter-opening into the cavity of the cyst through the loin.

Our knowledge of pancreatic cysts has been greatly increased since Senn* of Chicago drew attention to them in 1885. Active surgical treatment of pancreatic cysts has been the consequence, and it has been accompanied by remarkable success.

Chyle Cysts.—This is perhaps the best place to mention a rare but interesting kind of tumour which would certainly complicate the diagnosis of a pancreatic cyst. It is known as chyle cyst of the mesentery. The sac of the cyst appears to be formed of the separated layers of the mesentery, the interspace being occupied by fluid identical in its physical and chemical characters with chyle. Such tumours sometimes attain very large sizes. They require the same treatment as pancreatic cysts.

Dr. Adolph Rasch† has written an excellent account of a typical example of chyle cyst.

Dacryops.—This term is applied to cysts occurring in the upper eyelid; they are due to distension of the ducts of the lachrymal gland. They appear, as a rule, in the upper and outer part of the eyelid, the cyst extending beneath the border of the orbit towards the lachrymal gland. The cyst enlarges when the patient weeps. Dacryops may arise in two ways—either as a consequence of wound or abscess of the lid, or as a congenital defect. As a rule, they are of traumatic origin. The condition is one of extreme rarity.

Hulke,‡ in an interesting paper on this subject, states his belief that these cysts were first accurately described by

* *The American Journal of the Med. Sciences*, 1885, vol. xc., p. 18. Newton, Pitt, and Jacobson (Med.-Chir. Trans., vol. lxxiv., 455), give a good list of references.

† Trans. Obstet. Soc., vol. xxxi. 311. *See also* Bramann, *Arch. für Klin. Chir.* (von Langenbeck), bd. xxxv., s. 201; Mendes de Leon, *Am. Journal of Obstet.*, vol. xxiv., p. 168; Fetherston, *Australian Med. Journal*, 1890, p. 475.

‡ R. Lond. Ophth. Hosp. Reports, vol. i., p. 285.

Dr. J. A. Schmidt in 1803, and that Beer (1817) mentions that he had seen six cases of this kind, which he describes under the name "dacryops" which Schmidt had applied to them.

When these cysts are opened through the skin a fistula is sure to be the result. The same thing often happens when the cysts have a traumatic origin. The condition is then termed *dacryops fistulosus*.

CHAPTER XLVIII.

PSEUDO-CYSTS—DIVERTICULA AND BURSÆ.

The term **diverticulum** is used to denote hernia or protrusion of the lining membrane of a cavity through a defective spot in its walls. Such protrusions occur in connection with the œsophagus and intestines; the bladder; the trachea; also in relation with joints and tendon-sheaths forming synovial cysts and ganglia; and in blood-vessels forming sacculated aneurysms and varices.

Intestinal Diverticula.—These are hernial protrusions of the mucous membrane of the bowel through interspaces in the muscular coat. Structurally they consist of mucous membrane with a covering of peritoneum. Sometimes a few strands of muscle fibre can be detected stretched across the pouch.

Frequently diverticula occur in multiples; as many as two hundred have been found in one case. These pouches occur in all parts of the intestine, but are most frequent in the colon, and especially about the sigmoid flexure. In the small intestine they usually occur along the line of the attachment of the mesentery. In the colon they are found about the attachment of the appendices epiploicæ, and may even project into them.

In dimensions diverticula vary greatly—some are as small as peas, others as large as oranges. When the pouches are numerous, as a rule, they are small; when few in number, or solitary, they may be large. Intestinal diverticula are common in old persons, but they rarely lead to serious consequences.

Some writers describe diverticula of the intestines as consisting of two varieties, *true* and *false*. According to this arrangement a persistent vitello-intestinal duct would be called a true diverticulum. (*See* page 389.)

Vesical Diverticula.—Hernial protrusions of the mucous membrane of the bladder between the fasciculi of the muscular coat are of frequent occurrence. The cause of the protrusion

is impediment to the free flow of urine; the obstruction may be seated in the urethra or at the neck of the bladder. Under such conditions there may be several diverticula: the bladder is then said to be sacculated. Sometimes there is only one saccule, and this may attain a large size. Vesical diverticula usually communicate with the cavity of the bladder by large orifices. A sacculus extending into the suspensory ligament of the bladder must not be confounded with a urachus cyst.

Sacculated bladders, apart from the cause that produces the saccules, do not often give rise to trouble. Calculi are sometimes found within them, and in cases where the outflow of urine is seriously obstructed the walls of a sacculus will sometimes yield, and allow the urine to extravasate into the surrounding loose connective tissue.*

As impediments to the free escape of urine from the bladder occur more frequently in men than in women, it naturally follows that sacculated bladders are most common in men. Nevertheless, vesical diverticula of large size are occasionally found in women, and in exceptional cases have caused death.†

Pharyngeal Diverticula (*Pharyngoceles*).—Localised dilatations of the pharynx are of three kinds:—

1. Abnormal persistence and distension of certain pouches which, as a rule, exist in the embryo only—*e.g.*, the pouch of Rathké and the branchial clefts.‡
2. Pouching of the pharyngeal wall at its junction with the œsophagus.
3. Protrusions (herniæ) of the mucous membrane lining Rosenmüller's fossa.

The cysts of the first kind have been already discussed in chapter xxxv. Dilatations of the pouch of Rathké are considered at page 317, branchial cysts at page 327, and the curious guttural pouches of the horse at page 387.

* *For* an interesting account of the relation of diverticula of the bladder to extravasation of urine *cf.* Lane, Guy's Hospital Reports, 1885.

† Hale White, Trans. Path. Soc., vol. xxxiv. 146.

‡ Pouches of the naso-pharynx have been described in detail by Kostanecki, Virchow's "Archiv," bd. cxvii., 108.

Pharyngoceles.—In order to appreciate the nature of at least one form of pharyngeal pouch it will be necessary to take into consideration an interesting congenital defect to which the pharynx is liable.

It occasionally happens that children are born with what is known as an **imperforate pharynx,** that is, instead of the pharynx and œsophagus forming a continuous tube, the pharynx terminates as a cul-de-sac near the level of the cricoid cartilage.

In such cases the upper end of the œsophagus terminates by opening into the trachea through its posterior wall. The situation of the œsophago-tracheal fistula varies in different specimens; sometimes it is as high as the third tracheal semi-ring, or it may be as low as the bifurcation of the trachea, and in at least one case it opened into the left bronchus. In most examples of imperforate pharynx the œsophagus is connected with the lower end of the pharynx by a fibrous band, which indicates that the two structures were originally continuous, but that their continuity has been disturbed by secondary changes. (Fig. 220.)

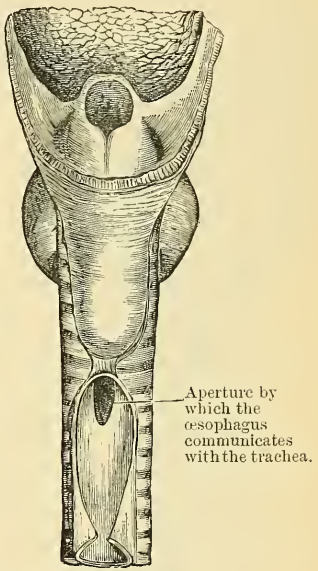

Fig. 220.—Imperforate pharynx.

The constant association of an œsophago-tracheal fistula and imperforate pharynx indicates some relation between the two conditions. The explanation which at once suggests itself is, that it may be due to some influence exercised by the pulmonary diverticulum which leaves that portion of the embryonic fore-gut ultimately represented by the œsophagus.* (*See also* Imperforate Ileum, page 393.)

* This subject is handled with remarkable acumen by Shattock, Trans. Path. Soc., vol. xli., p. 87.

In some cases the pharynx instead of ending blindly may be abnormally narrow at its junction with the œsophagus, and a valve may exist. An imperforate pharynx is incompatible with life, but the œsophagus may be considerably stenosed and cause no inconvenience in deglutition (Fig. 221).

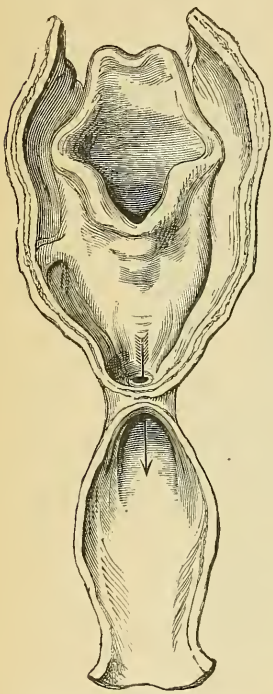

Fig. 221.—Septate pharynx.

It is necessary to describe congenital imperfections at the junction of the pharynx and œsophagus, because it is at this point that pouches are apt to form. A typical example of a pharyngeal pouch, or **pharyngocele**, is shown in Fig. 222. The case is very carefully described by Worthington.* The parts were obtained from a man sixty-nine years of age. There was a stricture of the œsophagus at the level of the cricoid cartilage that would admit merely a urethral bougie. This obstruction ultimately led to the death of the patient. He could swallow food and retain it for a time; it would then regurgitate. At the post-mortem dissection the pouch was detected; it was in shape like the finger of a glove, and had a depth of 9 cm. and a circumference of 6 cm. The mucous membrane at the seat of the stricture was quite healthy. About two-thirds of the pouch were covered with muscle derived from the inferior constrictor.

An examination of pharyngeal pouches such as exist in museums would lead the observer to believe that the orifice of communication between the pharynx and the pouch was circular; but there is good reason to believe that it assumes a slit-like form even when the pouch is full of food.

So far as our knowledge at present extends in regard to this variety of pharyngocele, it would appear that they arise in all probability as congenital effects, but it is important to

* Med. Chir. Trans., vol. xxx. 199.

remember that the pouch rarely causes inconvenience until late in life. Thus Ludlow's* patient was sixty; Worthington's, sixty-nine; Chavasse's,† forty-nine; and Butlin's,‡ forty-seven. It is necessary to point out that a pharyngocele of the character represented in Fig. 222 arises in a different manner to that depicted in Fig. 155; the latter is probably due to a persistent branchial cleft. It is also quite certain that any attempt to dissect out a lateral sac of this kind would require more skill than such a pouch as that shown in Fig. 222.

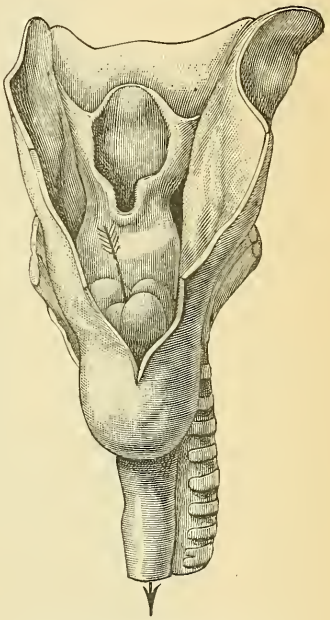

Fig. 222.—Pharyngeal diverticulum. (*After Worthington.*)

Treatment.— Pharyngoceles are likely to be much more carefully studied in the future than they have been in the past, for the condition has on more than one occasion been correctly diagnosed, and the pouch removed through an incision in the neck, and its slit-like orifice of communication with the pharynx occluded by sutures, a manœuvre that has been followed with complete success in the hands of Bergmann§ and Butlin.

Œsophageal Diverticula.— Hernial protrusions of the mucous membrane of the œsophagus through the muscular coat are not common. They vary greatly in size. Some are no larger than cherries, others may attain the size of a closed fist. Diverticula arise in any part of the œsophagus; nothing is known as to their cause.

Tracheal Diverticula.—These are small hernial protrusions of the mucous membrane of the trachea; they are uncommon and invariably occur near the junction of the

* "Medical Observations and Inquiries," 1767, vol. iii., p. 85, pl. v.

† Trans. Path. Soc., xlii. 82.

‡ Med.-Chir. Trans., vol. lxxvi.

§ Langenbeck's "Archiv," bd. xliii., s. 1.

trachealis muscle with the cornua of the semi-rings of the trachea. Rokitansky regarded them as dependent on chronic catarrh of the trachea. Gruber, on the other hand, was of opinion that they are retention cysts of the glands in the tracheal mucous membrane; they are of little clinical interest.

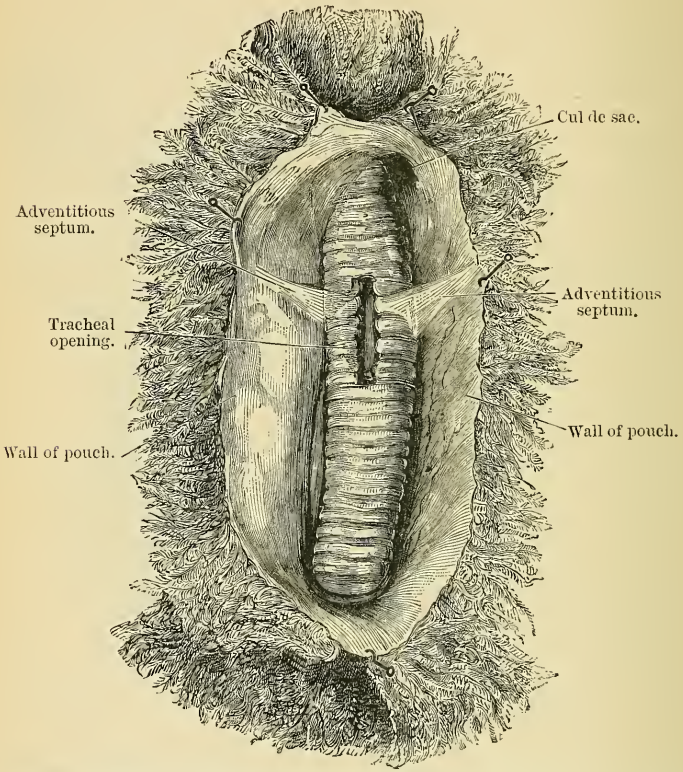

Fig. 223.—Tracheal opening and pouch of an emu. The pouch is cut so as to expose its interior. The surrounding feathers are cut short. (*After Murie.*)

The Tracheal Diverticulum of the Emu.—The emu (*Dromœus novæ-hollandiæ*) is normally provided with a tracheal diverticulum of great interest. In this bird there is a natural defect in the front of the trachea, at a spot varying between the fiftieth and sixty-fifth ring. The deficiency may involve six or more rings. In the emu chick the defect is scarcely noticeable, and the extremities of the rings are almost in contact. As the bird grows the tracheal mucous membrane becomes slowly herniated through the opening until it forms a huge sac between the skin of the neck and the trachea. The cyst-wall is composed of connective tissue with

scattered bundles of striated muscle fibre; its mucous lining is directly continuous with that of the windpipe, and is dotted with the orifices of glands. (Fig. 223.)

The adult emu inflates this sac when it produces the peculiar booming sound which resembles the noise made by blowing across the mouth of a large bottle.

This large tracheal sac may inflame and become distended with mucus. In a specimen which I secured and forwarded for preservation in the museum of the Royal College of Surgeons, London, the sac contained two pints of mucus. The bird was unfortunately drowned in this fluid, for while I was making an attempt to evacuate the contents of the sac the fluid entered the opening in the trachea and suffocated it.

Murie* has written an excellent account of the anatomy of the trachea of the emu. I can confirm his observations, having enjoyed the opportunities of dissecting the adult emu and the emu chick. Concerning the function of this pouch nothing is known.

Synovial Cysts.—Cysts containing synovia arise in three ways:—

(1) Hernial protrusions of the synovial membranes of joints.
(2) Bursæ in the immediate neighbourhood of joints.
(3) Hernial protrusions of the synovial sheaths of tendons.

Synovial cysts arise in connection with the hip, knee, ankle, shoulder, elbow, and wrist joints. They have been most carefully studied in connection with the knee joint. The cysts form swellings, in some cases as large as an orange, situated near the knee joint, usually in close relation with the tendons of the semi-membranosus, biceps, or gastrocnemius muscles. Occasionally the cyst will be situated in the calf on the inner side, sometimes as much as 8 cm. below the knee. When the swelling is situated near the joint, pressure will cause it to disappear, the synovia it contains passing into the general cavity of the joint. When the cyst is situated at a distance from the joint, pressure upon it has no effect in diminishing its size, because in many cases the communication between the cyst and the joint cavity is by a very narrow, almost capillary channel.

The cysts arise usually in connection with joints which are chronically diseased and seem to be common in tubercular joints. It is believed by those who have devoted special

* Proc. Zool. Soc., 1867, p. 405.

attention to these cysts that when the joints become distended with synovia, the internal pressure causes the synovial membrane to protrude through weak spots in the capsule, the diverticula making their way along the intermuscular planes.

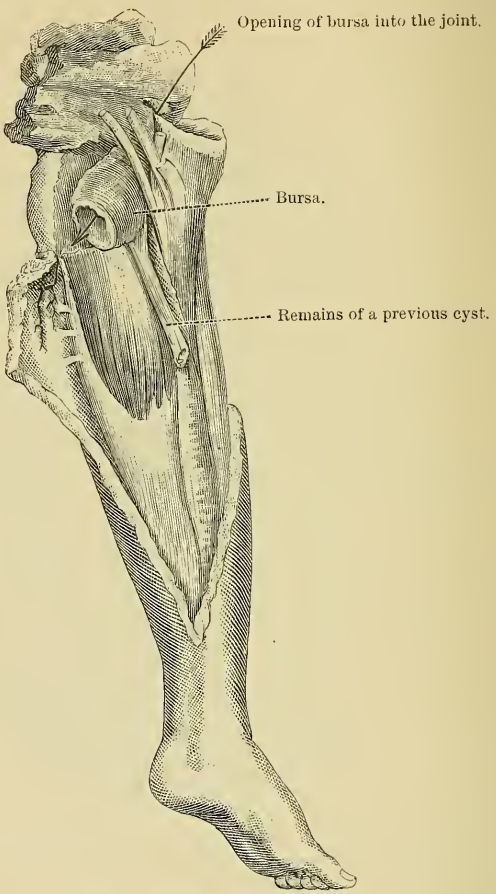

Fig. 224.—Bursa under the semi-membranosus tendon communicating with the knee-joint. A cyst had been incised and drained sixteen months previously. Its partially-obliterated channel persists. (*D'Arcy Power.*)

This mode of origin is on all-fours with that which obtains in the case of sacculated bladders.

It is also certain, for it has been demonstrated by dissection, that some synovial cysts are due to bursæ normally existing under the adjacent tendons, becoming abnormally large

and communicating with the joint cavity in consequence of absorption of the contiguous parts of the wall by pressure. (Fig. 224.) This seems to happen most frequently in the case of the bursa under the semi-membranosus. It does not necessarily follow because an individual has a synovial cyst near the knee that the joint is diseased; attendance in an out-patient room will show that many synovial cysts slowly disappear without treatment. This is important to bear in mind, for interference with these cysts is, as a rule, needless and often productive of much harm. Aspiration, injection of iodine, and the insertions of setons may lead to suppuration and destruction of the joint, with which the cyst is connected. Mr. Morrant Baker, who first drew special attention to these synovial diverticula, states that when they arise in connection with the **knee,** the cyst will project in the popliteal space, the upper part of the calf, or on the inner side of the calf as much as 10 cm. below the head of the tibia.

In the case of the **shoulder** the cyst projects in front of the joint a little below the clavicle, or in the upper third of the arm in the course of the long tendon of the biceps.

In the case of the **elbow,** the cyst projects on the inner side of the arm above the condyle. I have seen a cyst of this kind as high as the insertion of the coraco-brachialis, connected with the elbow joint by a tubular process of the diameter of the anterior interosseous artery. When they arise from the **carpal joints,** the cysts project on the back or front of the wrist. (*See* under Ganglion.) When connected with the **hip-joint,** the cyst forms a swelling in Scarpa's space, and in the case of the **ankle** the bulging is most marked in front and to the outer side of the joint.

The fluid contained in synovial cysts is in most cases identical with synovia. When the joint is the seat of tubercular disease the fluid in the cyst will contain pus cells, and occasionally it is true pus; when the skin over these swellings is red and glossy they have been mistaken for simple abscesses and incised.

Rarely the cyst contains melon-seed bodies. In one case Mr. Bentlif opened a cyst of this kind connected with the shoulder and removed two thousand of these bodies. Most of

them were of the shape and size of apple-pips, and like pips, had small stalks or tails.

Ganglion.—A ganglion is a cyst formed by the hernial protrusion of the synovial lining of a tendon sheath. There are two species—simple and compound.

A **simple ganglion** is seen in its most typical condition on the back of the carpus, where it forms a rounded, sessile, elastic swelling which becomes tense when the wrist is flexed, and partially, or wholly, disappears when the wrist is extended. Many of these swellings, which are entered in clinical records as ganglions (or ganglia), are not all connected with tendon sheaths. I have satisfied myself by careful dissections that many of them are diverticula from the carpal joints, and in some instances they arise from the inferior radio-ulnar joint. During life it is difficult to distinguish between a hernia of the sheath of a tendon or a diverticulum from a carpal joint. As in the case of the larger joints, synovial cysts arising from the carpus are occasionally associated with tubercular arthritis.

Ganglia are sometimes met with on the fingers in connection with the sheaths of the long flexors, and on the dorsum of the foot, as well as on the outer side of the ankle, in relation with the tendons of the peroneus longus and brevis. The fluid in a simple ganglion is clear, transparent and viscid, and resembles apple jelly.

The **compound ganglion** is a much more serious condition. It occurs mainly in connection with the flexor and extensor tendons at the wrist; it also occurs occasionally on the tendons of the peronei muscles, where they lie in relation with the calcaneum.

A compound ganglion at the wrist assumes an irregular shape and extends for a variable distance up the forearm; it also sends a prolongation under the annular ligament to appear in the palm, when it arises in connection with the flexor tendons; a similar extension under the posterior annular ligaments is usually noticed when a ganglion is connected with the extensor tendons. A compound ganglion is usually soft and elastic, and imparts a crepitant sensation to the examining fingers when the tendons are set in action. This crepitant sensation is due to the presence in the ganglion of small bodies familiarly known as **melon-seed bodies** from

their shape and consistence: they are sometimes present in enormous numbers. There is much difference of opinion as to the source of these bodies. I have seen them hanging from the inner wall of the ganglion. An examination of many of the loose bodies will show that they have slender stalks: these appear more clearly when they are floated in water. Bodies identical in structure are met with in synovial diverticula and even in bursal sacs, particularly the prepatellar bursa.

Treatment.—A simple ganglion, such as is so common on the back of the wrist, is in a general way successfully treated by bursting it subcutaneously by the direct pressure of the thumb, and then applying a graduated compress for a few days. When the wall is so thick that it will not rupture the swelling may be punctured with a very narrow scalpel; this allows the mucoid contents to escape, and the application of a firm compress for a few days will obliterate the sac.

Compound ganglia require more radical treatment. Many have been successfully treated by incising the sac, squeezing out the contents—particularly any loose bodies the sac may contain—and detaching those which may happen to hang from the wall by means of a scoop. The sac should be carefully drained. Now and then severe complications have followed this method of treatment, and it has been necessary to amputate through the forearm.

In some cases the ganglion has been successfully dissected out as if it were a tumour, and it would appear that the patient runs less risk from this mode of treatment than by the common practice of incision and drainage.

It is well to bear in mind that some of these ganglia are associated with the early stages of tubercular disease of the wrist joint, and a few are undoubtedly due to tubercular infection of the tendon sheaths.

BURSÆ.

On many parts of our bodies where muscles and tendons glide over osseous surfaces, or in situations where skin lies in close contact with bony prominences, membranous sacs occur filled with glairy fluids; such sacs are known as **bursæ.** Structurally a bursa consists of a thin-walled sac filled with

glairy fluid. The inner wall of the cyst is quite smooth and, as a rule, devoid of epithelium.

In certain situations, such as the anterior surface of the patella and the posterior surface of the olecranon, a bursa is normally present. Bursal sacs may form in any part of the subcutaneous tissues when the overlying skin is submitted to unusual intermittent pressure, as in talipes when the patient walks on the dorsum or side of the foot; beneath corns; and at the metatarso-phalangeal joint in the condition termed bunion. Such are called **adventitious bursæ.** When bursæ arise in connection with tendons, they are spoken of as **subtendinous bursæ,** and they often communicate with the sheath of the tendon, and even with an adjacent joint. The large bursa so constantly present at the insertion of the semi-membranosus often has a direct communication with the joint (Fig. 224).

The origin of bursal sacs has been explained in the following manner:—

When the skin moves over joints, or passes over hard prominences, the intermediate connective tissue becomes torn or ruptured, thereby leading to the formation of spaces in which fluid collects. The boundary walls are at first irregular, and formed by adjacent connective tissue. Finally this becomes smooth and forms the sac-wall.

Bursæ may arise during intra-uterine life when the fœtus is submitted to abnormal pressure. Many remarkable instances of this have been recorded, especially in association with talipes.

Most subcutaneous and many subtendinous bursæ arise after birth. When a subcutaneous bursa attains an abnormal size it is invariably due to unusual pressure associated with particular occupations. For instance, too much kneeling on hard material, whether in housemaids, devout persons, or carpet-layers, produces the familiar **prepatellar bursa;** repeated blows on the elbow produce **miner's elbow;** from carrying weights on the shoulder **porters** are liable to get a bursa over the acromial end of the clavicle; **tailors** from their cross-legged habit of sitting are sometimes troubled with one over the external malleolus; whilst **weavers** and **lightermen** from prolonged sitting on hard seats suffer from

bursæ over their ischial tuberosities: **soldiers** when sleeping too frequently on the hard floor of the guard-room get them over their greater trochanters; the pressure of ill-fitting boots develops a bursa over the enlarged head of the metatarsal bone of the hallux; when associated with partial dislocation of the first phalanx it is known as a **bunion,** and bursæ are quite common on the ends of **amputation stumps**. Clement Lucas* has described as the **needlewoman's** bursa a cyst that formed on the palmar surface of the terminal phalanx of the middle finger in an old seamstress.

A bursa is often present between the body of the hyoid bone and the thyro-hyoid membrane: sometimes it is very large and may attain the dimension of a fist.

Bursæ are liable to inflame, a process that may lead to suppuration, or stop short of that condition and become chronic or recurrent and lead to secondary changes in the walls of the sac, so that its cavity becomes almost obliterated. Chronically-inflamed bursæ sometimes attain the size of fists, especially the prepatellar and ischial varieties.

Jephson, in his interesting account of "Emin Pasha and the Rebellion at the Equator," relates that the women and many men of the Bari tribe whom he saw working in the fields, had enlarged prepatellar bursæ (housemaid's knee) due to kneeling whilst at work and to the fact that the entrances to the huts were so low that it was necessary to enter on the hands and knees.

Treatment.—An inflamed bursa demands rest and the local treatment usually employed for inflamed parts. When the bursa is distended with fluid, it is the custom to apply a plaster of mercury and ammoniacum over the swelling and fix it firmly with a bandage. It is probable that the firm compression is the chief agent in promoting the absorption of the fluid. In some cases the swelling subsides spontaneously and this probably explains the supposed efficacy of the application of tincture of iodine.

When bursæ are repeatedly irritated, the walls become so thick that it is necessary to excise the tumour. When the bursa is situated over the patella, malleolus, ischial

* Guy's Hospital Reports, vol. xliii. 143.

tuberosity, or trochanter its removal is a very simple proceeding.

When a bunion inflames and suppurates it may involve the underlying metatarso-phalangeal joint. Many of these cases, especially in elderly individuals, demand amputation of the toe. When it is necessary to carry out this measure, I find it much more satisfactory to remove the metatarsal bone as well as the toe.

When the bursa between the body of the hyoid bone and the thyro-hyoid membrane is very large it should be incised and drained. Care is necessary to avoid confounding an enlarged thyro-hyoid bursa with a cyst of an accessory thyroid gland and *vice versâ*.

CHAPTER XLIX.

NEURAL CYSTS.

UNDER this heading it is proposed to consider a number of conditions, some of which, like hydrocephalus and one variety of spina bifida, should be described in the genus, tubulo-cysts.

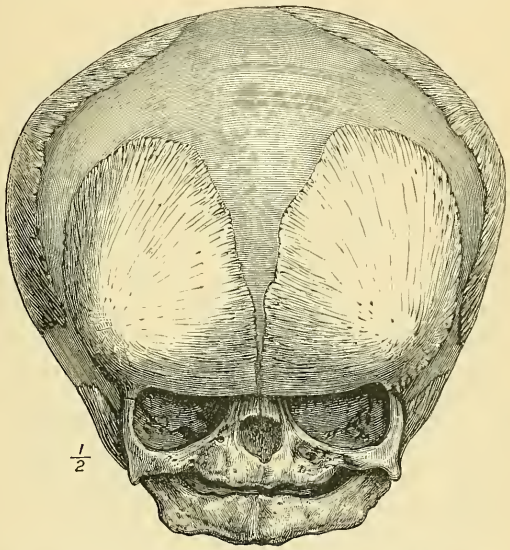

Fig. 225.—Hydrocephalic skull, from an infant. (*Museum, Middlesex Hospital.*)

Other varieties of spina bifida should be discussed with diverticula. On the whole it is more convenient to consider them collectively as a genus—**neural cysts**.

Hydrocephalus.—This term is applied to the head when abnormally enlarged in consequence of excessive accumulation of fluid in the ventricles of the brain. By far the larger majority of cases are congenital, or commence in the early months of infancy. Occasionally it will arise at a later period of life, when the fontanelles are obliterated; expansion of the skull is then impossible. Hydrocephalus very frequently accompanies spina bifida. Very many hydrocephalic fœtuses die during delivery, the large size of the head hindering its successful transit through the maternal passages. In some

cases the head ruptures in consequence of the pressure to which it is subjected, or is intentionally perforated. In most cases of hydrocephalus which survive delivery, distension is only slight at birth.

The frequency with which hydrocephalus and hydramnios co-exist would indicate that the association is something more than mere coincidence. Statistics respecting the frequency of

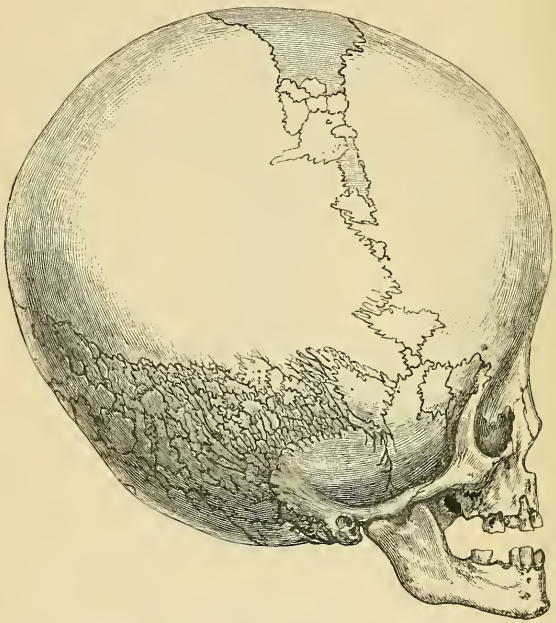

Fig. 226.—Hydrocephalic skull, showing Wormian bones. (*Museum, Middlesex Hospital.*)

hydrocephalus drawn from living children are untrustworthy, as pre-natal hydrocephalus is very fatal.

In typical cases of hydrocephalus attention is arrested by the large size of the cranium and the smallness of the face. This is due to the slow accumulation of fluid within the cerebral ventricles, distending them and causing wide separation of the cranial bones, whilst the bones of the face retain their natural proportions. The two halves of the frontal bone are separated from each other; the spaces between the parietal bones, and between these and the occipital, are far wider than usual. (Fig. 225.) Indeed, the bones of the cranial vault are

so separated from each other, whilst those of the base retain their usual juxtaposition, that the bones of a hydrocephalic skull were compared by Trousseau* to the petals of an opening flower.

The head may become so large as to attain a circumference of a metre, or even a metre and a half when measured horizontally—that is, from the superciliary ridges to the occiput. The

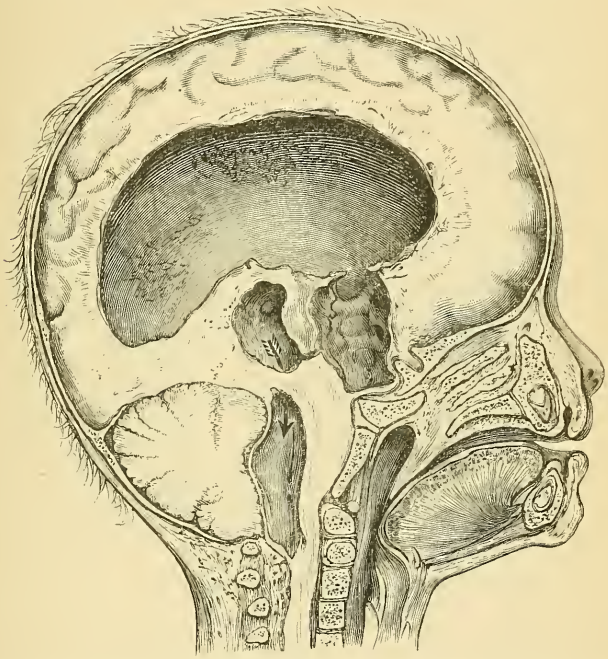

Fig. 227.—Sagittal section of a hydrocephalic skull from a child, with the brain *in situ*. The head of the arrow is in the fourth and its feathers in the third ventricle. The infundibulum is widely dilated. (*Museum, Middlesex Hospital.*)

bones are excessively thin, and consist of a single table. The vault presents large membranous spaces irregularly dotted with ossific deposits. The sutures in relation with the parietal bones are occupied with Wormian bones; as many as two hundred have been counted in one skull. (Fig. 226.) In hydrocephalics who attain adult life the skull may become completely covered in with bone.

* *Clinique Médicale*, tom. ii., p. 321.

The brain presents great changes. The lateral ventricles are widely distended, and the crura cerebri, corpora striata, optic thalami, and other structures in the base of the brain are flattened. The cerebral hemispheres form thin boundaries to the ventricles, often less than 10 mm. in thickness; the convolutions become obliterated. In nearly all the specimens the distension is limited to the lateral and third ventricles: occasionally the fourth ventricle is also distended. (Fig. 227.) In some specimens each lateral ventricle has been known to attain a length of 20 cm. and to communicate with its fellow through an opening the size of an orange.

When the ventricles are very distended and the skull is proportionally thin, a wave of fluctuation may be transmitted from side to side. In exceptional cases the head is translucent.

In an account of hydrocephalus it is difficult to avoid reference to the classical case of James Cardinal, especially as a cast of his head is to be found in many pathological museums. (Fig. 228.)

James Cardinal died at the age of twenty-nine years in Guy's Hospital under the care of Sir Astley Cooper, in 1824. He was born at Coggeshall, Essex, in 1795. At birth his head was very little larger than natural. A fortnight later it began to increase, and gradually grew until he was five years old; it then appeared to remain stationary. He was unable to walk until six years of age, but went to school and learned to read and write. His head was at this period translucent when placed between the eye of the observer and a bright light. Cardinal continued in tolerable health until twenty-three years of age, when he began to have fits, for which he applied to the hospital. His manners were childish, otherwise his mental faculties were well developed. Death eventually supervened from lung disease.

When the head was examined the brain was found lying at the base of the skull. Between the membranes there were seven pints of fluid. The ventricles contained one pint. It appeared as if the fluid had originally been contained within the ventricles, but had burst through an opening on the corpus callosum and compressed the brain downwards. The cranium measured 82·5 cm. (33″) in circumference, and had a

capacity of ten pints. The skeleton is contained in Guy's Hospital museum.

The fluid in hydrocephalus is identical with cerebro-spinal fluid. Occasionally it has been found to contain albumen. This may be attributed to inflammation, and has been observed in those cases where paracentesis has been performed. The

Fig. 228.—Drawing from a cast of the head of James Cardinal.*

amount of fluid may be very large. Six and eight, and even ten pints have been recorded.

Little is known as to the cause of hydrocephalus. In many cases obstruction to the interventricular communications has been detected. Hydrocephalus is often associated with spina bifida, and all the passages in the brain with the central canal of the cord have been found dilated. In several cases in which hydrocephalus supervened on spina bifida I found the central canal of the cord normal. Interference with the interventricular passages will produce hydrocephalus. In

* The cast from which this drawing was taken appears to have been moulded April 11th, 1822. Cardinal was then at St. Thomas's Hospital.

Fig. 229 the head of a lion-whelp is shown in sagittal section. The ossified tentorium is abnormally thick in consequence of rickety changes. This had depressed the vermiform process of the cerebellum and obstructed the Sylvian aqueduct, leading to distension of the lateral and third ventricles and the infundibulum.

The great difficulty encountered in investigating the pathology of this condition arises from the soft and diffluent nature of the brain of hydrocephalic fœtuses, especially when stillborn. It should also be remembered that many grave

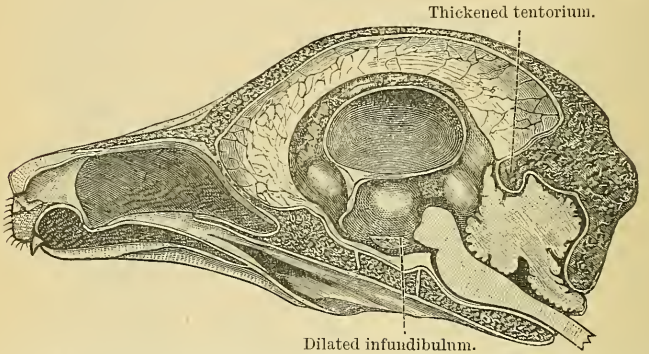

Fig. 229.—Head of a lion's whelp in section, showing great dilatation of the cerebral ventricles due to obstruction of the interventricular passages by a thickened (rickety) tentorium.

malformations of the limbs and viscera are often associated with hydrocephalus, and it is well to bear in mind the frequency with which it is accompanied by hydramnios.

Hydrocele of the Fourth Ventricle.—Leading from each lateral angle of the fourth cerebral ventricle there is a tubular process encircled by a duplicature of the ligula termed the cornucopia. These passages or **lateral recesses** are traversed by the choroid plexuses of the fourth ventricle, and the recesses themselves open into the subarachnoid space at the base of the flocculus, close beside the root filaments of the facial, auditory, glosso-pharyngeal and vagus nerves. These passages establish free communication between the fourth ventricle and the general subarachnoid space. When one of these processes becomes occluded, the recess will dilate and form what Virchow* terms **hydrocele of the fourth ventricle.**

* "Die Krankhaften Geschwülste," bd. i. 183.

This pathologist has figured a specimen that had attained the size of a cherry-stone and pressed upon the flocculus and the facial nerve: remnants of the choroid plexus of the fourth ventricle projected into the cyst. Though the walls of this cyst were thin, its pressure had caused paralysis of the facial nerve.

Recklinghausen* has described a case in which there was a hydrocele on each side of the fourth ventricle. The museum of the Middlesex Hospital contains a specimen described and figured by Sir Charles Bell, who also gives a history of the patient. Attached to the inferior surface of the left peduncle of the cerebellum, close to its junction with the pons, is a cyst the size of a pigeon's egg; it was filled with fluid the colour of urine. The fifth nerve, attenuated and flattened, appears to issue from the tumour, and can be traced along its walls up to within 1 cm. of its origin. The seventh and eighth nerves are lost in the tumour from within 5 mm. of their origin as far as the internal auditory meatus. (Fig. 230.)

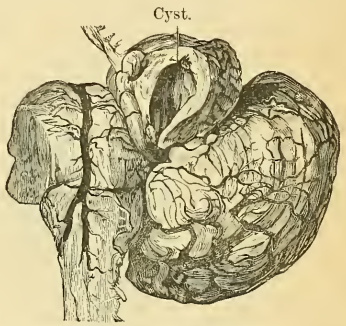

Fig. 230.—Hydrocele of the fourth ventricle. (*After Sir Charles Bell.*)

For tumours occurring in relation with the cornucopia, which might be confounded with "hydrocele of the fourth ventricle," the student should refer to the chapter on Psammomata.

Cranial Meningocele.—This term is applied to a hernial protrusion of the meninges of the brain through an unossified portion of the skull. When the protrusion consists of brain matter as well as membranes it is described as a **meningo-encephalocele.**

Meningoceles, using the term in its general sense, occur in definite regions. The commonest of all situations is the occiput; in about two-thirds of the cases the tumour projects in this part of the skull. Next in frequency to their appearance

* Virchow's "Archiv," bd. xxx., s. 374.

at the occiput, meningoceles appear at the root of the nose. In other regions of the skull they are excessively rare. It is usually stated that they may appear at the anterior fontanelle, but critical examination of the descriptions of suspected cases makes it probable that many of the supposed meningoceles were dermoids, and this was demonstrated in the cases described by Giraldes and Arnott and referred to at page 301.

Occipital meningoceles appear, during life, to protrude through the foramen magnum; when the parts are dissected the pedicle will be found to make its way through a gap in

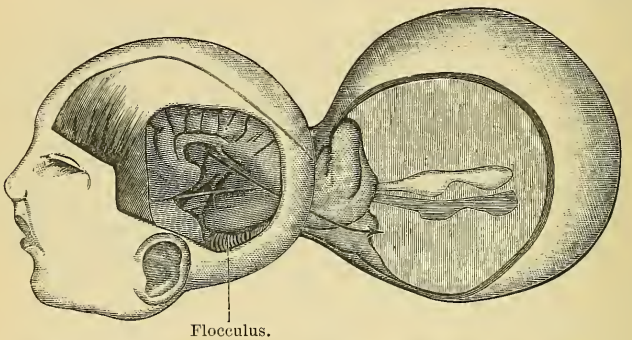

Fig. 231.—Occipital meningo-encephalocele. (*Museum, Middlesex Hospital.*)

the supra-occipital between the posterior margin of the foramen magnum and the occipital protuberance. This space during early embryonic life is occupied by a fontanelle.*

When the meningocele is examined it will be found to be covered externally by skin, and usually lined internally by tissue directly continuous with the ependyma of the ventricles. This is shown in Fig. 231. In this specimen the cyst was as large as the child's head; the cerebral matter projecting into it represented the corpora quadrigemina, whilst choroid plexuses floated in the fluid of the cyst. The cyst itself probably represented a dilated fourth ventricle. There was no cerebellum, but the flocculus was large and conspicuous.

The relation of the flocculus in cases of occipital meningocele is of importance. On reading the descriptions of reported cases of this malformation the cerebellum, if referred to, is described as rudimentary or absent. As a matter of fact, in

* Med.-Chir. Trans., vol. lxvii., p. 167.

these cases the cerebellum is absent, and that which is supposed to represent this part of the brain is an enlarged flocculus. Cleland* has pointed out that the flocculus is developed from a lateral outgrowth of the floor of the third encephalic vesicle, whilst the cerebellum is developed from the foremost part of the roof of that vesicle. An appreciation of this fact throws valuable light on the nature of occipital meningocele, for the absence of the cerebellum indicates that the hernial protrusion is the third encephalic vesicle; instead of its walls thickening to form a cerebellum, they become passively dilated into a cyst. Indeed this form of meningocele bears much the same relation to the fourth ventricle and the cerebellum, that hydrocephalus bears to the lateral ventricles and the cerebrum. An occipital meningocele might not inaptly be described as *hydrocephalus limited to the fourth ventricle.*

My observations lead me to believe that a cranial meningocele (a cyst formed of cerebral membranes only) is excessively rare.

Occipital meningo-encephaloceles often hang so low as to render it difficult to decide whether the cyst belongs to the cranium or to the cervical region of the spine. There is reason to believe that the pedicle of a cranial meningocele may become obliterated so as to cut off the communication between the cyst and the subdural space. I have never had an opportunity of dissecting a specimen in which this has happened. Such an event certainly occurs with spinal meningoceles.

A cranial meningocele is sometimes associated with spina bifida; such a combination is, as a rule, accompanied by gross malformations, especially in connection with the lower limbs.

It has already been mentioned that dermoids are apt to be mistaken for meningoceles, and it is certain that meningoceles are sometimes mistaken for dermoids. Thus Powell† operated on a Bengali, twenty-two years of age, at the Konapara Hospital, Cachar, for a supposed sebaceous cyst, about the size of a tennis-ball, situated in the left temporal region. On incising the cyst it was discovered to be a meningocele

* *Journal of Anat. and Phys.*, vol. xvii., p. 257.

† *Brit. Med. Journal*, 1893, vol. i., p. 232.

and the hole in the skull would admit an index finger. The cyst was removed and the patient recovered rapidly.

For one case that recovers from operations on a cranial meningocele ten die.

Individuals with meningoceles, particularly when the cyst is large, rarely survive their birth many weeks. Death is usually due to sloughing of the sac and consequent septic meningitis.

Cephalhæmatoma is the name given to a collection of blood extravasated in consequence of injury between the vault of the cranium and the pericranium. It is most commonly seen in newly-born children that have presented by the head. The swelling in these cases is familiar to practitioners as the *caput succedaneum*. In the course of a few days it will completely disappear.

Cephalhæmatoma arises on the heads of children as a consequence of blows or falls, and in the majority of cases the effused blood is slowly absorbed. In a certain proportion of cases suppuration occurs, and the hæmatoma is converted into an abscess. This is particularly liable to occur if air is admitted either through abrasion of the parts at the time of the accident or by exploratory punctures made by the surgeon. In most cephalhæmatomata a few days after their formation a hard ridge forms around the confines, and this when contrasted with the pulpy, yielding sensation imparted to the finger by the rest of the swelling often gives rise to the impression that the individual has sustained a depressed fracture of the skull. Knowledge of the fact is, as a rule, sufficient to prevent error in diagnosis.

This hard ridge is interesting in another way, for it is liable to ossify. In many cases as the blood is absorbed this ridge likewise disappears, resembling in this respect callus around a fractured long bone. In rare instances adventitious bone thus formed may persist and form a large bony crater to the skull.

A very remarkable example of this has been placed on record by Treves.* The patient, a boy eleven years of age, had a large swelling on the head strictly limited to the right

* Trans. Clin. Soc., vol. xxi., p. 285.

parietal bone and covered with hairy scalp. (Fig. 232.) The central parts of this swelling were soft, fluctuating, and the seat of feeble pulsation, but the periphery seemed to consist of a crater of hard bone firmly adherent to the scalp. When this boy was four months old he fell from his father's arm, his head striking the floor; a bump formed, persisted, and increased in size as the boy grew.

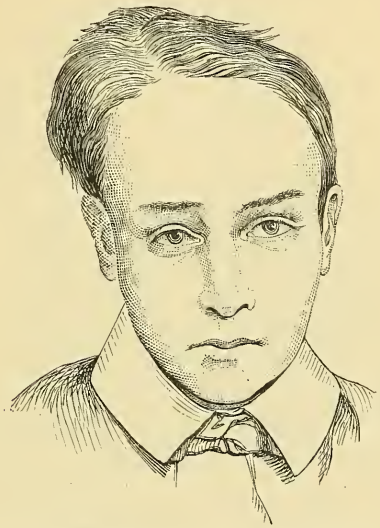

Fig. 232.—Boy with an old cephalhæmatoma over the right parietal bone. (*After Silcock.*)

Upon these facts Treves came to the conclusion that the tumour was primarily a cephalhæmatoma, a considerable portion of the wall having subsequently ossified.

Mr. Silcock brought this case again under the notice of the Clinical Society, and it was referred to a committee. This committee came to the conclusion that the tumour was probably a cephalhydrocele. (*See* page 457.)

The formation of bone in the peripheral portions of a cephalhæmatoma admits of simple explanation. Virchow long ago pointed out that the pericranium which forms the limiting capsule of the swelling is a bone-forming membrane, and though separated from the vault of the skull by blood, still pursues its bone-forming function. Another remarkable

character of a cephalhæmatoma is the great length of time the blood will remain fluid within it.

The most remarkable cephalhæmatoma that has come under my notice occurred in a monkey (*Cebus monachus*). When deposited in the Zoological Gardens this monkey had on its head a large rounded tumour (Fig. 233), which was soft

Fig. 233.—Monkey (*Cebus monachus*) with a huge cephalhæmatoma.

and fluctuating at the top, where a feeble pulsation was perceptible. That portion of the tumour near the skull was extremely hard and felt like bone. The monkey was in excellent health and seemed in no way encumbered by its burden. It continued in this way many weeks; the tumour did not increase in size, but the hardening of its walls became more extensive. Some months later the monkey fell ill, and as it seemed in great suffering I killed it by means of chloroform. The tumour when dissected was found to be an old cephalhæmatoma with extensive ossification of its walls (Fig. 234); the crater-like arrangement of bone on the top of the

skull was covered in by pericranium and contained dark fluid blood. The frontal bone where it formed the floor of the cavity was so thin that in places it yielded to the pressure of the finger, like parchment. Some of the ossicles which formed the walls of the cyst were bevelled at the edges and serrated, so as to articulate one with the other like Wormian bones. Fragments of these bones were examined microscopically and found to exhibit the structure of true bone. The serrations

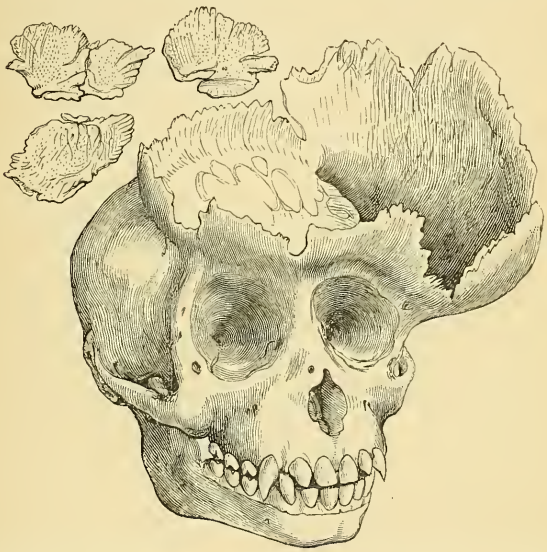

Fig. 234.—Skull of *Cebus monachus*, showing the bony walls of the cephalhæmatoma and a group of Wormian bones. (*Museum, Royal College of Surgeons.*)

at the edges of these bones were probably due to the movements of the cyst during their formation, for it was noted that there was slight pulsation.

Cephalhydrocele.—This is usually defined as a pulsatile tumour containing cerebro-spinal fluid communicating with the interior of the skull through an abnormal opening the result of injury; it does not demand further consideration here.*

* Smith, St. Barth. Hospital Reports, vol. xx. 233; Lucas, Guy's Hospital Reports, 1876, 1878, 1881, and 1884; Godlee, Trans. Path. Soc., xxxvi. 313.

Treatment.—It is rare that meningoceles, even small specimens, are submitted to treatment. Sometimes a meningocele is mistaken for a wen or dermoid and excised; during the operation the surgeon finds that he has opened the dura mater. This adventure generally ends in disaster; exceptionally, it has cured the patient. Even in successful cases, hydrocephalus has followed the removal of the meningocele.* (*See also* page 470). In several cases dermoids have been mistaken for meningoceles, and have remained undisturbed by the surgeon until some change in them has led to the discovery of their true character.

* Wright, *Brit. Med. Journal*, 1893, vol. i. 949.

CHAPTER L.

NEURAL CYSTS (*concluded*).

Spina Bifida.—The term spina bifida is applied to congenital defect in the union of the laminæ of one or more vertebræ,

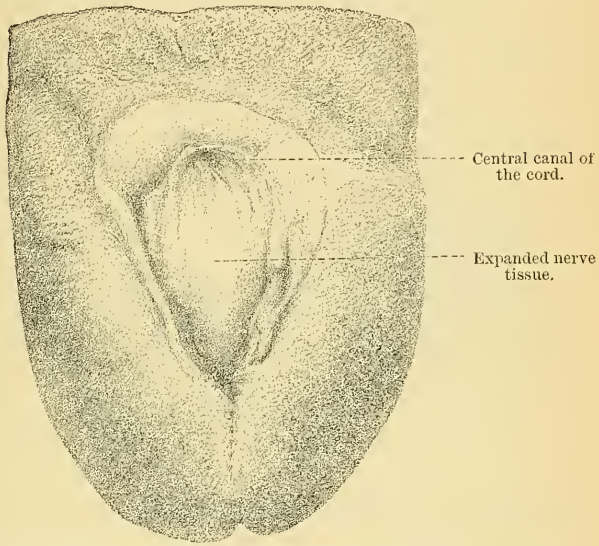

Fig. 235.—Lumbar region of a fœtus with spina bifida, variety myelocele. (*Museum, Middlesex Hospital.*) (*After Shattock.*)

associated with malformation of the spinal cord or its membranes.

The spinal cord and a large part of the brain are formed by the dorsal coalescence of the medullary folds. The fusion of these folds commences in the thoracic and extends into the cephalic and caudal regions. For a short time after coalescence the embryonic cord and superficial epiblast remain in contact. Gradually they become separated by the intrusion of connective tissue, some of which chondrifies and afterwards ossifies to form vertebræ and intervertebral discs. In the early stages the cord has a longitudinal extent equal to that of the notochord, and this equality is maintained for some time after the closure of the medullary groove.

Subsequently the vertebral column grows at a greater rate than the nerve-tube; the result is that at birth, the medullary cone at the end of the cord is opposite the upper border of the second lumbar vertebra.

The species of **spina bifida** are determined according to the stage of development at which the defect occurs, as determined by the anatomy of the parts. They are :—

(1) Myelocele, (2) syringo-myelocele, (3) meningo-myelocele, (4) meningocele, (5) masked spina bifida (*spina bifida occulta*).

1. *The medullary folds may unite imperfectly and give rise to a* MYELOCELE.

This condition is well illustrated in Fig. 235. In this case

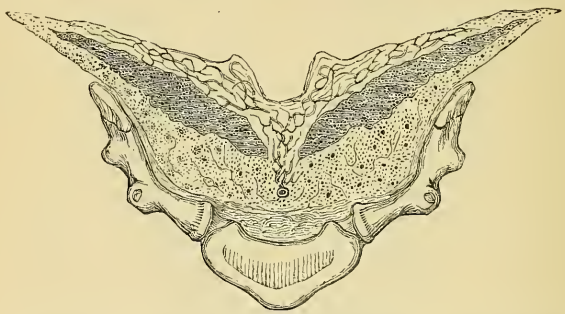

Fig. 236.—Diagram to represent the microscopic characters of a transverse section of a myelocele.

the cord is normally formed in the cervical and thoracic regions, but in the lumbar portion the central canal suddenly opens on to a shallow depression, the sides of which are slightly intumescent and then become gradually continuous with the skin. The tissue surrounding the furrow represents the medullary folds and consists mainly of very vascular nerve-tissue. When fresh this area is of a bright red colour and resembles a nævus.

When this pink tissue is carefully dissected from the underlying vertebræ and prepared for the microscope, it will exhibit on each side of the furrow nerve-cells embedded in neuroglia, intermixed with plexuses of arterioles, venules, and capillaries (Fig. 236). It is hard to determine the existence of epithelium on the surface of myeloceles, because there is usually some inflammation and occasionally sloughing.

This species of spina bifida is fairly common, but it is very rare in museums, because it does not produce a tumour in the loin, and is then regarded as atypical and cast away.

Myeloceles are, according to my observations, more common in the stillborn than in children that survive their birth a few days. I am of opinion that is the commonest species of spina bifida.

Children with myeloceles rarely live more than a few days; the central canal of the cord, being open, allows a continual draining away of the cerebro-spinal fluid, which soon leads to death.

2. *The medullary folds unite throughout, but fail to separate from the surface epiblast. The central canal becomes subsequently dilated:*—SYRINGO-MYELOCELE.

Syringo-myelocele is an excessively rare form of spina bifida, and cannot be determined from simpler forms during life. When the parts are dissected the distinguishing feature is that the nerves gain the intervertebral foramina by running round the convexity of the cyst. (Fig. 237.)

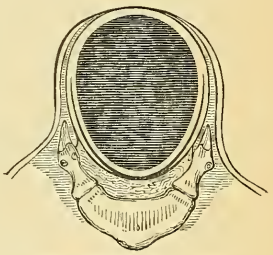

Fig. 237.—Syringo-myelocele in transverse section.

Although syringo-myelocele is very rare in a typical form it may occur in combination with a meningocele. Clutton* has carefully described an example. (Fig. 238.)

3. *The cord is normally closed but, before it separates from the surface epiblast, becomes compressed by a collection of fluid within the meningeal spaces:*—MENINGO-MYELOCELE.

Probably two-thirds of all cases of spina bifida that survive their birth are meningo-myeloceles. The condition is easily recognised; there is a deficiency in the arches of the vertebræ, usually in the lumbar region, occupied by a cyst of variable size. Unless inflamed, or flaccid in consequence of leakage, the cyst is translucent and often presents a pink tinge. Its most posterior part is somewhat flattened, and occasionally a shallow median groove is seen. In some specimens quite in the centre of the cyst there is a small

* Trans. Clin. Soc., vol. xix., p. 99.

umbilicus marking the central canal of the cord. At the edge of the cyst where its walls become continuous with the skin the margin is slightly raised, and immediately beyond this the skin, even in the new-born, may present a circle of long hairs.

Meningo-myeloceles are often associated with hydrocephalus and, in a large proportion of cases, with double

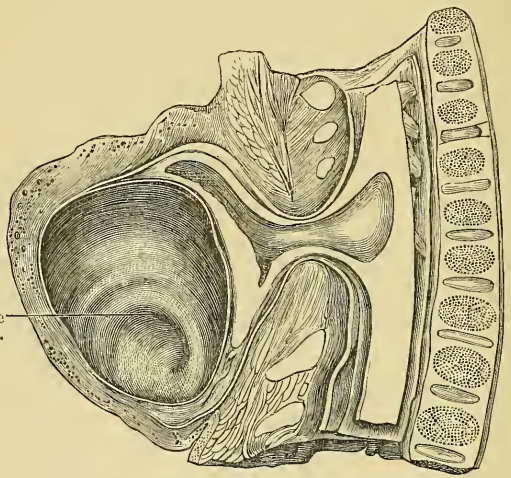

Fig. 238.—Syringo-myelocele and meningocele in longitudinal section; from the cervical region. (*After Clutton.*)

talipes equino-varus, and other severe deformities of the lower limbs.

On transverse section of a meningo-myelocele the cord is found flattened on the posterior wall of the cyst like a strap, whilst the nerves reach their respective foramina by directly traversing the cavity of the cyst. (Fig. 239.)

That the strap-like band of nerve tissue on the posterior wall of the sac is the flattened spinal cord was demonstrated by Shattock.* He cut sections of this part of the cyst and detected the central canal. (Fig. 240.)

4. *The cord is normal, but there is a local hernia of the membranes:*—MENINGOCELE.

Protrusion of the membranes unaccompanied by the cord is by no means common in spina bifida. Although it has

* Trans. Clin. Soc., vol. xviii., Spina Bifida Report.

been met with in the cervical region of the spine, it most frequently affects the lumbo-sacral region, or may be entirely confined to the sacral portion of the spine. Some writers on this malformation believe that the hernial protrusion may make its way between the arches of two vertebræ instead of between the laminæ of a single vertebra. It is a fact that the sac of a meningocele sometimes emerges through a very narrow orifice, and in a few instances this causes the cyst to become more or less pedunculated, and may lead to occlusion of the aperture by which the dural space and the cyst communicate and thus isolate the cyst.

Virchow* investigated a remarkable specimen illustrating this process. The patient was a negro child born with a large tumour pendulous from its buttock. (Fig. 241.) The tumour was removed in Central Africa and sent to Virchow, under the impression that it was a fatty tumour. Dissection revealed a central space in the tumour lined with dura mater, which was covered with fat intermixed with muscle tissue. The structure and arrangement of the parts were such as to lead Virchow to the opinion that the tumour was the sac of a meningocele. (Fig. 242.)

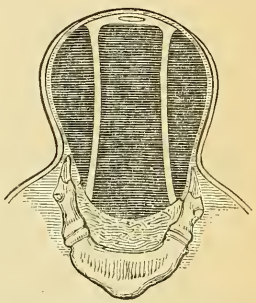

Fig. 239.—Diagram showing meningo-myelocele in transverse section.

A tumour in many respects similar to this, save that it occurred in the cervical region of the spine, was removed by Solly in 1856 from a woman twenty-seven years of age. The description of the case is accompanied by an exceedingly interesting clinical history.† Protrusions of dura mater unaccompanied by cord or nerves (meningoceles) are more common in the sacral region than elsewhere. In some instances the membranes emerge through the deficiency (hiatus sacralis) normally present below the third sacral vertebra.

This will perhaps be the most convenient place in which to refer to an abnormal disposition of the cord which I have met with in association with spina bifida. It is well known

* "Archiv," bd. c. 571.

† Med. Chir. Trans., vol. xl., p. 19.

that in the early embryo the cord extends the whole length of the vertebral column, but at birth the apex of the medullary cone is on a level with the upper border of the second lumbar vertebra. I have placed in the museum of the Middlesex Hospital a spine with a large meningocele in the sacral region; the cord runs the whole length of the neural canal and terminates at the tip of the sacrum. The specimen was obtained from a child three months old.

5. *The cord and its membranes are normally formed, but the arches of one or more vertebræ are defective, but there is no protrusion of the membranes or cord*;—MASKED SPINA BIFIDA (spina bifida occulta).

This defect, as it is unaccompanied by a cyst, is very apt to

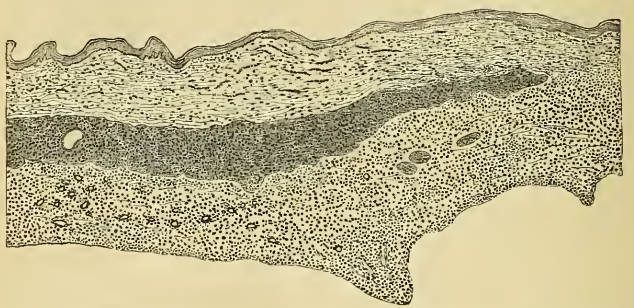

Fig. 240.—Microscopical appearances of the nerve tissue from the wall of a meningo-myelocele showing the central canal. (*After Shattock.*)

be overlooked. An interesting feature usually associated with this condition is an abnormal growth of hair in the loins. Hair fields of this description may be localised to the loin, as in the original case described by Virchow* (Fig. 243), and the hair may form a long tuft, as in Fig. 244. In exceptional cases an abnormal growth of hair may extend from the loins over the buttocks and for a considerable distance down the thighs.

The two varieties observed in the distribution of hair in these cases are well illustrated by the arrangement adopted by artists and sculptors in their representations of fauns and the goat-footed satyrs or ægipans. (Fig. 245.)

* "Zeitschr. für Ethnologie," 1875, bd. vii. 280, taf. xvii., fig. 2.

Many cases of spina bifida are accompanied by an excessive development of hair in the loin in addition to the "masked" species. Attention has already been drawn to the fact that a circlet of hairs is often observed on the

Fig. 241.—African child with a pedunculated tumour (an occluded spina bifida sac) attached to its buttock. (*After Virchow.*)

skin immediately bordering the sac of a meningo-myelocele, even in new-born babes.

This excessive development of hair associated with defective closure of the neural arches is interesting when studied in connection with the luxuriant growth of feathers on the heads of Polish fowls, for in many of these birds there is defective ossification of the bones of the cranial vault. An important condition often associated with spina bifida occulta is perforating ulcer of the foot. Indeed this association is now so well recognised that in every case of perforating ulcer of the foot, occurring in young patients, it is the duty of

the surgeon, as a matter of routine, to examine the loins. The girl represented in Fig. 244 was under treatment for an ulcer of the foot and caries of the metatarsal bones, and in the course of the clinical investigation the spinal defects were detected.

In addition to non-union of the arches in the vicinity of spina bifida, the vertebræ are liable to be defective in other ways, and of these the most striking is the absence of half a vertebra—that is, half the centrum, with its pedicle lamina, transverse, articular and spinous processes, are wholly wanting. The persistent half of such a vertebra has the characters shown in Fig. 246, and is often ankylosed to the vertebra above and below. Sometimes the half vertebra is in excess of the ordinary number. Exceptionally, a considerable extent of the column will be replaced by an alternating series of half-vertebræ; this is especially seen when the cervical portion of the column is the seat of spina bifida.

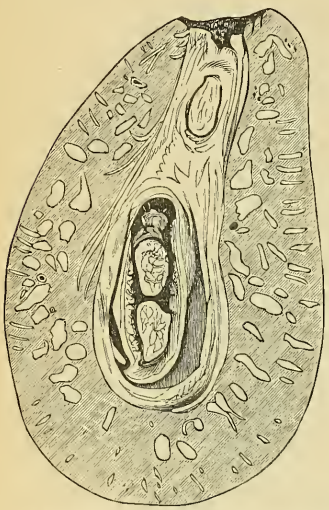

Fig. 242.—Tumour from the African child (*see* previous figure), shown in section.

Half-vertebræ occur occasionally independently of spina bifida; they have also been detected in the spines of snakes and calves. I have found them in fish (sole) and in the rabbit. The amount of disturbance sometimes caused in a vertebral column by spina bifida is very remarkable. Occasionally horizontal processes of bone project from the vertebral centra into the neural canal, and sometimes transfix the cord. Several examples have been carefully described in which the cord has bifurcated and coalesced again in order to enclose a beam of bone crossing the canal in a sagittal direction.*

* Shattock, Trans. Clin. Soc., vol. xviii.; Report of Spina Bifida Committee, p. 34 and plate vi.; and Sir George Humphry, *Journal of Anatomy and Physiology*, vol. xx., p. 585.

Complications of Spina Bifida. — Unfortunately all species of spina bifida are apt to be associated with other serious conditions, such as talipes equino-varus, single and double, and other gross deformities of the legs, hydrocephalus, meningocele, and malformations of the alimentary canal, such as imperforate anus and on rare occasions imperforate pharynx.

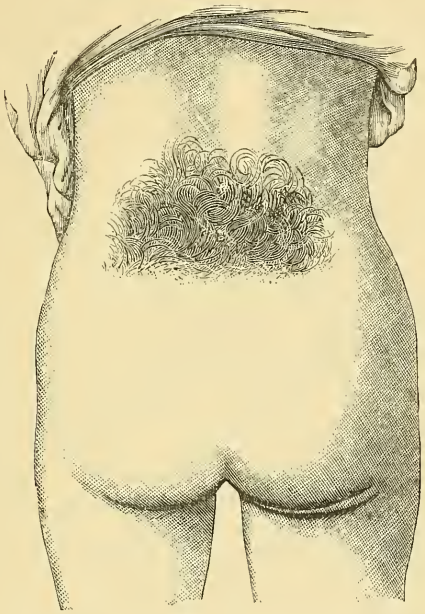

Fig. 243.—Hair field on the loin overlying a spina bifida occulta. (*After Virchow.*)

Very exceptionally these two imperforate conditions of the alimentary canal have coexisted.

The most serious complication of spina bifida is **hydrocephalus**: the ventricular cavities of the brain may be abnormally dilated at birth; in many cases the hydrocephalus slowly develops during the first few weeks of infant life, and the head gradually assumes enormous dimensions. In a small proportion of cases the sac of the spina bifida spontaneously shrinks; coincidently with this the fontanelles gradually widen and hydrocephalus develops. I have in several children seen hydrocephalus supervene when the sac in the loin has been caused to shrink by artificial means. The

specimen from which the drawing (Fig. 227) was prepared occurred secondarily to injection of the sac.

We have now to consider the various modes by which spina bifida destroys life. Of all the species of this malformation, **myelocele** is the most fatal. A very large proportion of fœtuses in which this condition is present are stillborn: the few that survive their birth rarely live longer than three days, the continued leakage of cerebro-spinal fluid being sufficient to explain the invariable brevity of their lives.

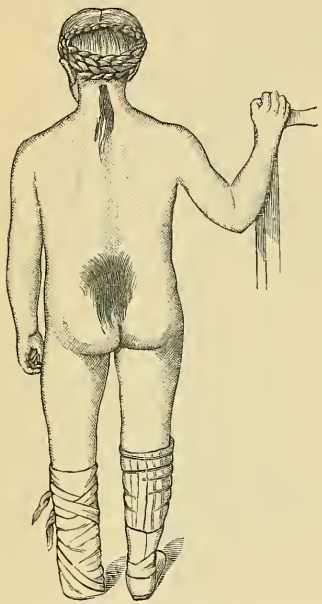

Fig. 244.—Hair field overlying a spina bifida occulta; there is also a long tuft on the cervical region. (*Fischer.*)

When a distinct sac is present life may be prolonged many weeks, even when the sac-wall is thin; when it is thick, life may be prolonged several years; and when it is completely skin-covered some of these children survive and grow up to be healthy men and women. The prospects of the case are largely influenced by the thickness of the sac-wall and the absence of complications, especially hydrocephalus.

In many cases, especially when the walls of the cyst are thin, the tissue is apt to slough—an event that allows the sudden escape of the cerebro-spinal fluid and may terminate the life of the child in a few hours. Children often survive this accident to succumb seven or ten days later from septic meningitis. Exceptionally, I have observed children recover from rupture of the sac and, escaping meningitis, slowly die from hydrocephalus. Occasionally the sac in the loin and the hydrocephalus will increase simultaneously. In such a case pressure on the anterior fontanelle will increase the tension in the spina bifida sac, and *vice versâ*.

The duration of a child's life with spina bifida, excepting the "masked" species, is very uncertain; it is often prolonged

when the nurse and mother are careful, and vigilantly preserve the sac from injury.

That spina bifida is a serious affection may be gathered from the figures in the Registrar-General's Reports; about 800 individuals in England die from it every year. This information is not precise, as the actual number of cases

Fig. 245.—Ægipan sporting with a faun (p. 464). (*Bacchus and Silenus.*)

is much greater, because the birth of the stillborn is not registered. No facts are really accessible that will enable an accurate estimate to be formed of the real frequency of the malformation.

Treatment.—In a very large number of patients treatment avails nothing. In a number of cases attempts have been made to excise the sac; but now the pathological anatomy of the condition has been more carefully investigated and the difficulty of deciding between the species during life is so well recognised, few surgeons will be rash enough to excise a spina bifida sac save in exceptional circumstances. The operation has been occasionally successful; in many it has produced permanent paraplegia.

In adults, when the sac has become pedunculated and the connection with the subdural space occluded, it may be removed successfully, as is well illustrated in Solly's classical case (page 463).

All reported cases of the successful removal of the sac of a spina bifida from adults should be carefully studied, because in some instances they may have been dermoids. Meningoceles sometimes simulate fatty tumours (*see* page 15).

The treatment which gives best results is that introduced

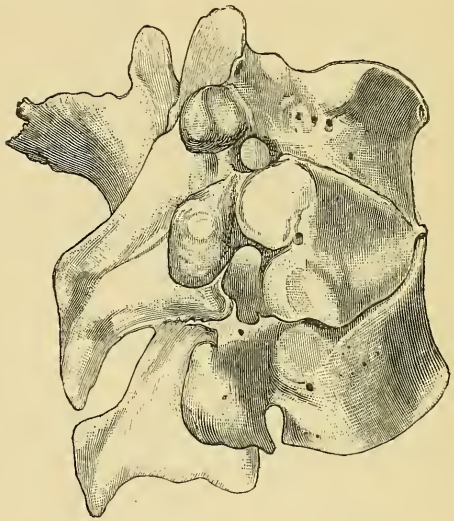

Fig. 246.—Half-vertebra. (*After Shattock.*)

by Morton of injecting into the sac a small quantity (one to two drachms) of iodo-glycerine solution. This consists of iodine, ten grains; iodide of potassium, thirty grains; dissolved in an ounce of glycerine. This method employed on suitable cases has been followed by a large measure of success. Suitable cases are those in which the sac is small and has a thick wall (especially if the sac be completely covered with skin) and there is an absence of hydrocephalus. The best time to begin this treatment in favourable cases is two months after birth. It must be borne in mind that hydrocephalus may supervene after the sac has been shrivelled by the injections. However, in spite of numerous failures and subsequent

disappointment in apparently successful cases, the treatment by iodo-glycerine injections is not only the safest, but the most hopeful method that has yet been devised for the relief or cure of spina bifida.

The Evolution of the Central Nervous System. — The extraordinary frequency with which the membranous and bony coverings of the central nervous system are malformed, induced me some years ago to investigate the abnormalities collectively classed under the term spina bifida, with the hope of obtaining some light as to the mode of evolution of the brain and spinal cord, for as I pointed out in 1886, the pathological behaviour of the central canal of the cord indicated that it was an obsolete passage. In 1887 I came to the conclusion from embryological and pathological data that the brain and cord were in all probability *evolved from a segment of the primitive intestine.** This view has been confirmed since by the independent researches of Gaskell.†

Tails.—This account of spina bifida would be imperfect without a brief notice of tails, real and supposed, in the human subject. We may with Virchow‡ arrange tails in two classes, *true* and *false*. True tails may be *complete* or *incomplete:* the most perfect or complete tails contain bony segments (vertebræ), as in the case of cats and dogs: the less perfect or incomplete tails are like those of pigs, soft and flexible. No one has yet reported an example of a tail in the human subject containing bony elements. Several cases have been investigated in which an appendage 5 cm. long, and soft like a pig's tail, has been found directly continuous with the coccygeal vertebræ.

Most of the cases reported as tails were examples of congenital sacro-coccygeal tumours, or a tuft of hair covering a masked spina bifida (Fig. 244). Tumours supposed to be tails were in some cases dermoids (Fig. 149); in others fatty tumours (Fig. 14), or the sacs of a spina bifida (Fig. (241), and in many teratomata (Fig. 187).

* *Brain*, vol. x. 429.

† *Journal of Physiology*, vol. x., p. 153.

‡ "Berliner Klin., Wochenschr.," 1884, No. 47.

CHAPTER LI.

HYDATID CYSTS.

The term **hydatid** formerly covered a large number of pathological productions, but the term is now restricted in human pathology to the cystic stage of *Tænia echinococcus*. This cestode, which in its mature form inhabits the intestines of dogs, is about 4 mm. in length and consists of four segments, of which the fourth is larger than the rest of the body and is the only segment that becomes mature.

The eggs of this worm are passively conveyed either with food or water into the alimentary canal of man, where they are hatched: the embryo migrates from the intestine into some vascular organ or tissue, or by gaining entrance into a blood-vessel, is passively conveyed into some distant part of the body and becomes transformed into a cyst.

The cyst-wall has a peculiar structure; it consists of an external, highly elastic, lamellar cuticle, and an internal lining consisting of granular matter, cells, muscle tissue, and a water-vascular system.

The inner lining is often referred to as the parenchymatous layer. In addition to the proper tissues of the cyst, there is a more or less complete fibrous capsule derived from the adjacent connective tissue. The true cyst is maintained in apposition with the fibrous capsule by the pressure of the contained fluid; when this is removed by the abstraction or escape of the fluid, the mother-cyst at once collapses.

When the hydatid attains the size of a walnut, small vesicles or **brood-capsules** develop from the parenchymatous layer. These brood-capsules develop numbers of heads or **scolices**. The scolex when fully developed is about 0·3 mm. long, is furnished with four sucking discs and a rostellum of tiny blunt hooklets; it has a water-vascular system and numerous calcareous particles. The fore part of the scolex can be withdrawn into the hinder part; indeed this is the position in which they are usually found.

As fresh brood-capsules and scolices are formed, the cyst enlarges and, when seated in an organ or cavity of the body

which imposes little restraint upon its growth, it may attain enormous proportions—*e.g.*, hydatid cysts of the liver have been known to acquire a capacity of sixteen pints.

In many hydatids, **daughter-cysts** are formed from brood-capsules and probably from scolices. Cysts containing large numbers of these translucent thin-walled vesicles are known as **echinococcus-colonies.** (Fig. 247.)

Occasionally hydatids even of large size do not contain vesicles or brood-capsules; such are said to be **sterile.** The walls of sterile hydatids exhibit the characteristic lamination,

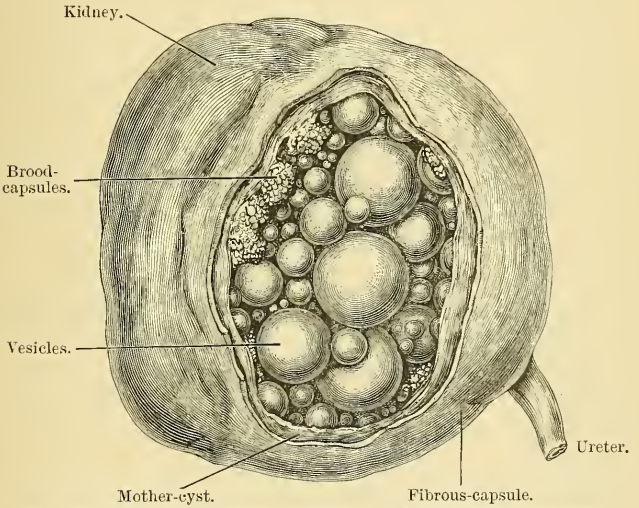

Fig. 247.—Echinococcus-colony in the kidney. (*Museum, Middlesex Hospital.*)

and this enables the nature of the cyst to be recognised in otherwise doubtful cases.

There is an exceptional mode in which hydatids manifest themselves known as **multilocular hydatids** (*Echinococcus multilocularis*, Virchow). In this condition the vesicles are of small size, but occur in great number, and are not contained in a mother-cyst. The vesicles in such cases rarely exceed a pea in size, but the majority are much smaller; very many are no larger than millet- or rape-seed. This variety occurs most frequently in the shafts of long bones. (Fig. 248.) They have also been observed in the spinal canal.

The multilocular hydatid also occurs in the liver as a firm tumour, which on section presents trabeculæ of dense fibrous tissue, which causes it to assume an alveolar appearance. The alveoli contain a gelatinous substance in which the shrunken vesicles are embedded.

Fig. 248.—Multilocular hydatids of the shaft of the humerus. (*After Graham.*)

Most of these minute vesicles are sterile, but here and there a few hooklets can with patience be demonstrated. Virchow* was the first to demonstrate the hydatid nature of such tumours in the liver; previously they had been described as colloid cancer. In very rare instances contracted and shrunken vesicles, embedded in gelatinous material and surrounded by a distinct cyst, have been observed in the liver.† No satisfactory explanation has yet been advanced to account for this curious variation in the development of hydatids.

The usual mode of termination of a hydatid is to cease to grow; it then dies, shrivels up, and calcifies, assuming a friable appearance like old mortar.

When the cyst continues to grow its tendency is to rupture; the great tension exerted by the accumulating fluid, and especially the formation of daughter-cysts, induces necrosis of portions of the cyst-wall.

When hydatids are contiguous to hollow viscera, such as the intestine, stomach, trachea, and the like, the cyst is apt to come into contact with them, and the mutual pressure leads to absorption of the intervening tissue, and allows of the transmission of gas, air, or the osmosis of fluids which kill the parasite, and the entrance of septic organisms establishes suppuration.

* *Verh. d. Phys. Med. Ges. zu Wurzburg*, 1856, bd. vi. 84. (*See also Aust. Med. Journal*, 1884, p. 171.)

† Sheild, Med.-Chir. Trans., vol. lxxv. 175.

In many instances the communications between hydatids and hollow viscera are so free that the contents of the cyst are evacuated. In some instances this is a fortunate termination; but frequently it is a catastrophe to be dreaded, as it may immediately cause death, or lead to secondary changes that have ultimately a fatal issue.

In rare cases the contents of the cyst become converted into colloid material of about the consistence of gelatine.

Geographically, the hydatid has a very wide distribution, which corresponds with that of the dog. It is, however, far more frequent in some regions of the world than others. Iceland is notorious for the frequency with which its inhabitants fall victims to hydatids; after allowing great latitude for errors in the direction of excess in calculating its frequency, hydatid-disease must be regarded in the light of a persistent epidemic so far as that island is concerned.

Next to Iceland, Silesia is usually regarded as the most infected district in Europe. In Australia hydatids are excessively frequent, and whereas most of the monographs on this disease in its clinical aspects, written thirty years ago, were founded in a large measure on observation made in Iceland, during the past ten years at least we have looked to the writings of Australian physicians and surgeons for information on the pathology, diagnosis, and treatment of hydatids.

In Asia the disease is known; it occurs in India, though it is far from common. In America the disease is not frequent; judging from the few references to it in American literature, hydatids appear to be far rarer in North America than in the British Isles.

Zoologically hydatids are not very restricted, for they have been observed in monkeys, lemurs, cows, sheep, goats, deer, camels, antelopes, giraffes, horses, asses, zebras, hogs, squirrels, and kangaroos in addition to man.

Topographical Distribution in Man.—Although a hydatid cyst may form in almost any organ in the human body, it occurs with greater frequency in some organs and tissues than in others. A comparison of statistical tables compiled in Iceland, Germany, Australia, and America brings out most decisively the fact that hydatids are met with more frequently

in the liver than in all other parts of the body together; whilst in other organs, such as the breast, thyroid gland, or spinal cord, the literature of a century would furnish probably under a score of trustworthy cases. Hydatids, in addition to the above organs, have been found in the following:—kidneys, lung, spleen, bones, suprarenal capsule, scrotum, cerebrum, cerebellum, heart, axilla, orbit, etc. It is a curious fact that no one has recorded an undoubted example of a hydatid cyst in the ovary or testis.

Hydatids occur singly or may be distributed over the body in great numbers. The effects to which they give rise vary with the situation and dimensions of the cyst. For instance, a cyst of such a size as to cause no inconvenience when seated in the liver would, if growing in the brain or walls of the heart, soon induce death from mechanical causes. Again, a hydatid of the liver will often attain a very large size before causing inconvenience to the patient, whereas one half the size situated in the pelvis would produce much distress by interfering with the function of the rectum or bladder. On the other hand, a small hydatid of the liver no larger than an orange when accidentally ruptured and its contents escaping into the peritoneal cavity may rapidly destroy life, but a cyst the size of a melon, or larger, bursting into the rectum will not lead to much trouble; but even a small cyst so seated as to rupture into the trachea will, when the event comes to pass, almost inevitably cause death by suffocation. Indeed the ways in which hydatids kill are so many and so various that they will be dealt with under each organ.

Liver.—Hydatids are more common in the liver than in any other organ. The frequency with which these cysts occur in the liver as compared with other viscera is not due to any selective power on the part of the echinococcus embryo, but may be attributed to the fact that it finds its way into the gastric tributaries of the portal vein and is passively conveyed into the gland. As a rule they occur singly in the liver, but many instances have been reported in which three or four hydatids have been present: but there is apparently no limit to their number, for the museum of St. Thomas's Hospital contains a portion of a liver enormously enlarged in consequence of the presence of a multitude of hydatids.

The relative frequency of hydatids in the liver, the large size they attain in this organ, and the risk they occasion to life have caused them to be very attentively studied.

When the cyst ruptures spontaneously it may take various directions. Thus it may burst into the **pleura** and give rise to fatal pleurisy. Should the **lung** be adherent to the diaphragm, the cyst may open into it and the contents be discharged through the bronchial tubes and trachea. Under these conditions gangrene of the lung may follow the rupture.

In a few instances the cyst has burst into the **pericardium**. Such an accident is rapidly fatal, as the inundation of the

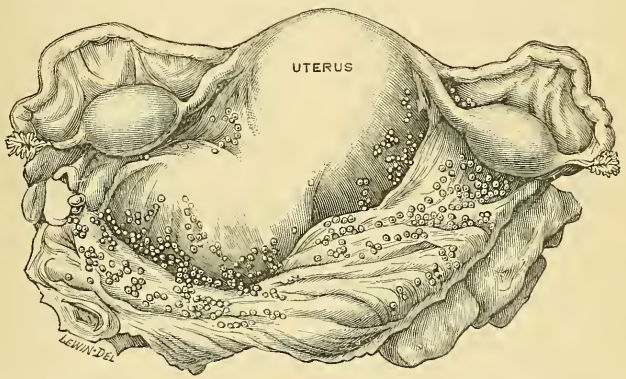

Fig. 249.—Multitude of minute hydatids on the pelvic peritoneum, probably secondary to the tapping of a cyst in the liver. (*After Graham.*)

pericardial cavity by fluid and vesicles embarrasses the heart. In some cases death has followed from pericarditis.

Rupture of a large cyst into the peritoneal cavity leads to serious consequences, but when the cyst is small it may lead to general infection of the peritoneum (Fig. 249). In a case under my care there was reason to believe that a hepatic cyst had ruptured into the lesser bag of the peritoneum, for the whole of the small omentum was thickly beset with small hydatids. Graham records a similar observation. The cyst has been known to rupture into the **stomach**, the vesicles being afterwards vomited; and in a few cases they perforated into the **intestine**, the contents of the cyst being discharged by the anus.

Among the rarer directions, hydatids have been known to rupture into the **biliary passages**, and the obstruction caused

by the vesicles has induced jaundice, and their subsequent passage along the common duct has produced biliary colic.

Another excessively rare direction is for the cyst to rupture into the **inferior vena cava**, the contents reaching the right side of the heart.

Cases have been reported in which the pressure of a cyst has induced atrophy of the intercostals and its contents discharged externally. They have also been known to burst externally near the umbilicus. Suppurating cysts may terminate in any of the directions mentioned above.

Hepatic hydatids may cause death by their size embarrassing respiration, or by pressure on important organs, such as the **vena cava**, producing **anasarca**; or hindering the circulation through the **vena porta** and causing **ascites**; whilst suppuration will lead to exhaustion or induce death by septicæmia or pyæmia.

When hydatid fluid escapes into the peritoneal cavity it is apt to produce an urticarial eruption known as the **hydatid rash**. It usually appears shortly after the cyst has been ruptured or punctured; it itches intensely, lasts two or three days, and is usually accompanied by high temperature and sometimes by abdominal pain. It is referred to by several observers. Krabbe writes:—"A curious phenomena is habitually observed when hydatids rupture into the peritoneal cavity: it provokes a transient urticaria." *

Finsen† refers to two cases worth mentioning in relation to the rash. Paul Helgason, aged twelve years, had for four years a large tumour in the right hypochondrium extending to the umbilicus. The lad received a blow from a cow's horn upon the belly that caused the tumour to disappear. Almost immediately the body was covered with a rash like an urticaria, but it soon disappeared.

In another patient, a pregnant woman had a hepatic hydatid for six years. Three days after delivery, whilst lying quietly in bed, she was suddenly seized with acute pain in the abdomen; the tumour of the liver disappeared, and in a short time the skin presented a papular rash.

Hepatic hydatids may be accidentally ruptured in a variety

* "Recherches Helminthologiques en Danemark et en Islande." 1866.

† *Arch. Gén. de Méd.*, 1869, xiii. 23.

of ways—such as blows, falls on the belly, by the wheels of a cart, or during an embrace in "a moment of exuberant affection." *

The Heart.—Hydatids of the heart occur under two conditions:—(1) The cyst may form in the muscle tissue of the heart—that is, in the walls of the ventricles or auricles; or (2) the vesicles are conveyed to the cavities of the right side of the heart as emboli, in consequence of the rupture of a hydatid cyst into some large vessel such as the vena cava.

When a cyst forms in the heart it may develop in the walls of the auricles. Of this many cases have been recorded.† In the walls of the ventricle they appear to be rare and never attain a large size.‡ Graham states that in the Sydney University pathological museum there is a specimen in which a hydatid occupies the interventricular septum.

Cardiac hydatids usually terminate the life of the patient suddenly, sometimes without rupture; but as a rule, the fatal event is due to this cause, the cyst-contents being discharged into the pericardial, auricular, or ventricular cavities. When the cysts open into the right cavities of the heart the vesicles may be carried as emboli into the pulmonary artery. If into the left cavities, they may be carried into the systemic arteries. Oesterlen§ recorded a case in which a girl, twenty-three years of age, developed gangrene of one leg. This was amputated and she died of pyæmia. A cyst the size of a pigeon's egg situated in the cardiac wall had burst into the left auricle; hydatid membrane was discovered in adherent thrombi in the common iliac artery, and an entire vesicle was found in the deep femoral artery.

The Lungs.—Hydatids occur in the lungs under two conditions:—(1) The cyst, for it is usually single, may be situated wholly within the substance of the lung, and in most cases chooses the lower lobe, especially of the right lung; or (2) it may grow in the tissue immediately beneath

* Treves, Trans. Clin. Soc., vol. xxi. 82.

† Moxon, Trans. Path. Soc., vol. xxi., p. 99; and Graham, "Hydatid Disease," p. 134.

‡ Trans. Path. Soc., vol. xv. 247.

§ Virchow's "Archiv," bd. xlii., p. 404.

the pulmonary pleura and project as an outgrowth from the lung into the pleural cavity.

When the cysts are small they occasion little inconvenience, but increasing in size they compress the lung and lead to hæmoptysis.

Apart from the mere pressure effects produced by the cyst, it is liable to rupture into the bronchial tubes, and pieces of membrane and vesicles are coughed up and indicate the nature of the case. When the cyst communicates with a bronchial tube, suppuration of the cyst is the inevitable consequence. Should the cyst rupture into the pleural cavity, empyema is the usual result.*

It is well to bear in mind that because hydatid vesicles and membrane are coughed up it does not necessarily follow that the cyst is seated in the lung. Hepatic hydatids are sometimes evacuated by this route.

Hydatids of the Kidney.—A large number of cases of renal hydatids have been recorded. The cyst may occupy the substance of the kidney or grow immediately beneath the capsule. In each situation the hydatid may attain a very large size and lead to extensive atrophy of the renal tissue. When of small size they rarely give rise to trouble or even inconvenience during life, and their existence is only known in the course of a post-mortem examination (Fig. 247).

Large hydatids appear as fluctuating tumours in the loin and simulate hydronephrosis.

There are good reasons for believing that the greater proportion of hydatids of the kidney rupture into the pelvis of the organ, the fluid and vesicles passing down the ureter to be discharged by the urethra. This is, of course, the most satisfactory mode of termination, except perhaps, death of the parasite with subsequent calcification. Now that surgeons are so interested in renal tumours it is very probable that more accurate information will soon be accessible.

Bones.—Hydatids occur much more frequently in long than in flat bones, but in either situation they are extremely rare. When occupying the medullary cavity of a bone they induce atrophy of the shaft from the persistent pressure they

* Curnow, Trans. Path. Soc., vol. xxxiv., p. 24.

exercise, and at length the bone breaks (spontaneous fracture) from some trivial injury. In some of the cases operations have been undertaken for the relief of abscesses supposed to be due to necrosis, and when the bone has been opened up, hydatid vesicles have escaped. Hydatids appear in the medullary cavity of bones in two forms:—

(1) *The cyst may be sterile.* An example of this is preserved in the museum of the Royal College of Surgeons; the cyst occupies the medullary cavity of the humerus of an ox.

(2) *There is no mother-cyst, but the medullary cavity is occupied by a multitude of vesicles.* This appears to be the usual condition in which hydatids occur in bone.

Hydatids have a preference for the **tibia** among bones; the museum of Guy's Hospital contains one, and the museum of St. Mary's Hospital* two examples.

In Coulson's † case the tibia was occupied by hundreds of vesicles. The patient was a woman twenty-five years of age. The cyst extended to near the ankle. The symptoms had existed for nearly eight years.

Graham‡ has recorded and figured a good example in the humerus. (Fig. 248.) The patient was a woman, thirty-five years of age, who had a tense swelling in the lower part of the arm; this was incised, when pus and a number of small vesicles escaped. The arm was amputated at the shoulder joint. At the lower part of the bone the shaft was converted into a fusiform sac in which there were large numbers of vesicles, most of them entire and healthy. The head and lower extremity were the only parts of the bone free from the parasite. There was no trace of a parent-cyst.

Webb § has recorded a case that occurred in the shaft of the femur. The patient, a man twenty-six years of age, complained of pain over the trochanter of the left femur; soon a swelling appeared. Eventually this was incised, and two or three hundred vesicles in various stages of development and degeneration escaped. There was no appearance of a mother-cyst.

* Cat. Museum, St. Mary's Hospital, 1891.
† Med-Chir. Trans., vol. xli., p. 307.
‡ "Hydatid Disease," p. 132.
§ *Aust. Med. Journal*, 1891.

When the hydatids occupy the ends of bones they may break into the adjacent joint. In the well-known case of Travers the cysts occupied the lower end of the femur and the upper end of the tibia. The cysts that had suppurated communicated with each other through the knee joint.*

Carline's † extraordinary specimen, represented in Plate IX., is almost the counterpart of this.

Thomas has reported a case which grew in the ilium. The museum of St. Bartholomew's Hospital contains half a pelvis in which hydatids occupied the ilium and the sacrum. Virchow refers to a specimen of hydatids in the sternum. They have also been found in an ungual phalanx.

Hydatids of the **thyroid gland** are very rare; they usually terminate by bursting into the trachea. This is always a fatal accident. Hydatids have been observed in the **adrenal**.

Birch-Hirschfeld‡ reported an instance of a hydatid lying in the cavity of the **vermiform appendix,** which was dilated to twice the thickness of the thumb. It contained the remains of hydatid membrane, which presented under the microscope the characteristic lamination. The appendix contained a great number of semi-transparent vesicles, varying from a pin's head to a pea in size: most of these were sterile. The communication between the appendix and the cæcum was obliterated. The walls of the appendix and its mucous membrane were atrophied from the pressure exerted by the cyst, and presented mosaic-like impressions caused by the pressure of the vesicles. The patient was a man thirty-eight years of age.

The Mamma.—Echinococcus cysts in this gland are very rare: records of at least twenty cases are accessible. The patients were in nearly all instances adult women. The disease takes the form of a slowly increasing, painless swelling, which may involve the whole breast or project as a smooth, elastic, fluctuating tumour from some portion of its circumference. These cysts may exist in the breast for ten years or longer without producing much inconvenience: they have

* Cat. St. Thomas's Hospital Museum, 1890, part i.

† *Brit. Med. Journal*, 1892, vol. ii., p. 632.

‡ *Arch. d. Heilkunde*, 1871, p. 191.

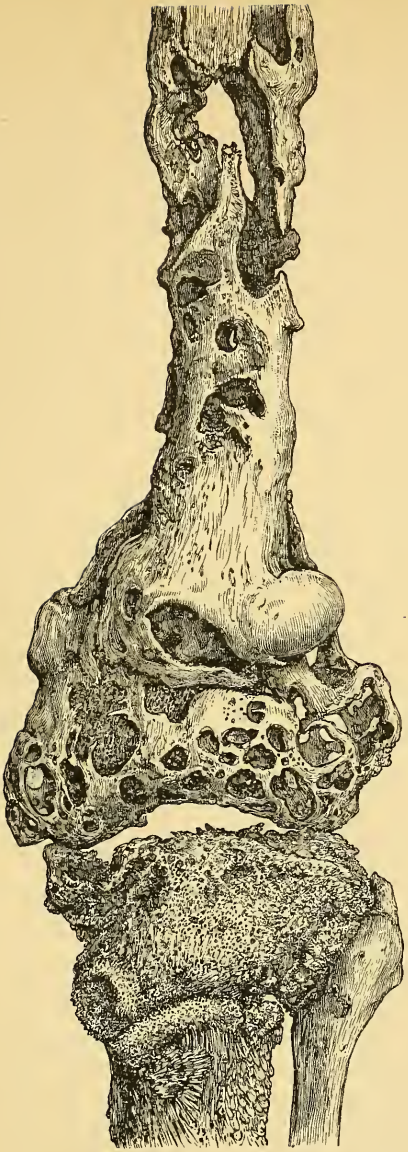

PLATE IX.—Lower two-thirds of a Femur, with the upper fourths of the Tibia and Fibula. The remnants of the Femur and Tibia are fenestrated osseous shells, in consequence of the pressure exercised by multilocular hydatids which began in the Femur, invaded the knee-joint and involved the Tibia. There is a sequestrum in the Femur measuring 7·5 cm. by 4 cm. Carline's case. (*Museum, Royal College of Surgeons.*) ½ nat. size.

been reported with a capacity of twenty ounces. Occasionally the cyst suppurates.

Diagnosis, in countries where the echinococcus is not common, is very difficult without the assistance of an exploratory puncture. This will clear up the case. In most of the cases that occurred in England the nature of the swelling was revealed when the surgeon made an incision into the breast for the purpose of removing it.

Drawings of mammary hydatids are given by Astley Cooper,* Bryant,† and others.

The Subperitoneal Tissue and Omentum.—Hydatids occur in these situations frequently in great numbers, and are often of large size. They may be pedunculated or sessile.

Muskett‡ reported a remarkable case in which the patient was supposed to be suffering from a hydrocele the size of an emu's egg. When tapped it was found to be a hydatid cyst. As a rule, when abdominal hydatids are numerous they are of small size; when solitary they may be very large. Should a solitary cyst be sterile, its true nature is liable to be overlooked.

Hydatids grow in the mesentery, the meso-rectum, or between the layers of the broad ligament of the uterus. In men many cases have been recorded in which a cyst of large size grew in the connective tissue between the bladder and rectum.

Many echinococcus cysts described as growing in relation with the liver, spleen, and uterus really lie in the tissue immediately beneath the serous covering of these organs, and are in a sense subperitoneal. If these cases be included it will be clear that the subperitoneal tissue is an exceedingly favourite situation for hydatids.

Connective Tissue of the Trunk and Limbs.—Many cases have been recorded in which hydatids have been found in the axilla, orbit, posterior triangle of the neck, etc. Their nature is rarely suspected until the swelling is incised.

Brain.—Hydatids of the brain occur either in connection with the meninges or in the brain substance. In either

* "Diseases of the Breast," plate ix.

† "Diseases of the Breast," 1887, plate viii., figs. 3 and 4.

‡ *Aust. Med. Gaz.*, 1886, p. 57.

situation they are not common. The **cerebrum** seems to be the most frequent seat of the cyst, and the right hemisphere lodges them twice as often as the left. In the **cerebellum** they are rare. When the cyst occupies the membranes it presses upon and produces a bay in the cortex of the cerebrum. In any part of the brain they rarely attain a large size, as their position causes them to bring about serious disturbances. It is often remarked by those who have recorded examples of intracranial hydatids that the damage produced by the cyst on the brain is out of proportion with the symptoms; but the same is equally true of almost all cerebral tumours.

Intracranial hydatids are not furnished with the thick adventitious capsule that surrounds them in most other situations: hence the cyst-wall is extremely delicate, and it is remarkable that hydatid cysts of the brain are nearly always sterile.

Echinococcus colonies are found occasionally in the brain. Mudd* has described a case that occurred in a girl of twelve years. The colony was lodged in the right motor area of the cerebral cortex, and produced absorption of the overlying bones and bulged externally. It was successfully treated.

Spinal Canal.—Hydatids occur in connection with the spinal canal under three conditions:—

(1) *The hydatids are situated entirely within the canal.* Such cases are divisible into two sets: (*a*) those inside the dura mater—such cases have been described by Bartels† and Wood‡; or (*b*) the cysts lie in the connective tissue between the bone and dura mater, as in a case recorded by Maguire.§ In several of these cases the hydatids were of the multilocular variety. Thus in Maguire's case there was a large number of vesicles, varying in size from a pin's head to that of a small chestnut, lying between the dura mater, the last cervical and upper six thoracic vertebræ. Ransom‖ has published a complete account of a case in which a hydatid the size of a

* *Internat. Jour. Med. Sci.*, 1892, p. 412.
† *Deut. Arch. f. Klin. Med.*, bd. v., s. 108.
‡ *Aust. Med. Journal*, 1879, p. 222.
§ *Brain*, vol. x., p. 451.
‖ *Brit. Med. Journal*, 1891, vol. ii. 1144.

chestnut grew from the arch of the tenth thoracic vertebra and produced paraplegia.

(2) *The hydatids affect the vertebræ and extend into the canal.*

Ogle* has described an example of this in which the cyst, containing a large number of vesicles, was lodged in the spinous process of the seventh cervical vertebra; it projected into the canal and pressed upon the cord.

(3) *The hydatids grow in the tissues outside the vertebræ, which are secondarily involved, the cyst extending into the canal.*

Several examples of this are known. Wilks and Moxon† describe a preparation in which numerous small hydatids extended widely in the subpleural tissue in the neighbourhood of the spine, which they perforated by eroding the vertebræ and then entered the neural canal and compressed the cord producing paraplegia. In this case the cysts were not enclosed by a mother-cyst (multilocular hydatids).

Cruveilhier‡ has given a good example of this which occurred in a woman thirty-eight years of age. It grew among the muscles in the vertebral groove and made its way between the arches of the twelfth thoracic and first lumbar vertebræ, and compressed the cord without entering the dural sheath.

Treatment.—The principles on which hydatid cysts are treated by surgeons consist:—

1. *In removing the cyst entire whenever this is possible.*

Failing this:—

2. *To incise the cyst-wall, evacuate the contents, and whenever possible remove the true cyst, and allow the cavity bounded by the capsule to close by granulation.*

The particular manner of carrying out the treatment varies with the situation of the cyst. The simplest condition is when a hydatid, or even six or eight, the size of cocoa-nuts hang from the **great omentum.** In such a case the tumours are exposed through an abdominal incision and withdrawn: the omental pedicles are tied and the cysts cut away. In

* Trans. Path. Soc., vol. xi., p. 299.

† *Path. Anatomy*, 1875, p. 64.

‡ *Anat. Path.*, liv. xxxv., plate vi., figs. 1 and 2.

many cases they are so firmly adherent to surrounding structures that they cannot be removed; it is then necessary to incise the fibrous capsule, or tear through them carefully with forceps and expose the mother-cyst, which is then easily enucleated. The empty capsules give no trouble. Suppurating hydatids demand incision and drainage.

In the case of hydatids in the **liver,** incision and drainage give excellent results. Great care should be taken to evacuate the cyst-contents thoroughly, and whenever possible, without the exercise of too much violence, the mother-cyst should be enucleated. The subsequent decomposition of this highly albuminous tissue is a source of very great danger to the patient.

All such methods of meddling with abdominal hydatids, as aspiration, punctures with trocars, and electrolysis, should be unhesitatingly condemned. No one should venture to tap or aspirate an abdominal cyst for diagnostic purposes. Such interference often works incalculable harm; whereas an exploratory incision carried out by a surgeon familiar with abdominal surgery is an operation infinitely safer than a thrust in the dark from a trocar. I have never seen an exploratory puncture of the belly do good; often it misleads, frequently converts a simple into an anxious case, and occasionally encompasses the death of the patient.

Hydatids in the **cerebral cortex** have been localised, exposed by trephining, and successfully drained. Verco* is of opinion that in about one-third of the cases of hydatids of the brain the cysts communicate with the lateral ventricles; hence when a cyst is opened by operation the cerebro-spinal fluid also escapes, drains the ventricles, and causes death. To obviate this he suggests that no drainage-tube should be employed, the flaps being closely stitched so as to seal up the cavity.

In the case of **bones** the treatment consists of incision, evacuation of the vesicles, and drainage. Exceptionally, when the bone is seriously damaged, fractured, or a large joint invaded, amputation has been necessary.

Large hydatid cysts of the **lung** require to be treated on the principles of empyema.

* *Brit. Med. Journal*, 1892, vol. ii. 1066.

CHAPTER LII.

THE ZOOLOGICAL DISTRIBUTION OF TUMOURS.

THROUGHOUT the course of this book many incidental references have been made to tumours occurring in vertebrate animals; it will perhaps be useful to summarise our knowledge on this matter, because there are many facts connected with it of great interest in their bearing on the Biology of Tumours.

As man in his bodily structure is kindred with the brutes, it would be expected that the various tumours known to occur in him would have their counterparts in vertebrata generally. For example, we should expect to find **lipomata,** especially as fat is a tissue so widely distributed in the animal kingdom; but this is not the case, and the few that have come under my observation occurred chiefly in horses, oxen, and sheep, and belong mainly to the subserous species. (*See* page 8.) In stall-fed oxen excessive accumulation of fat is common in the subperitoneal tissue, especially in the omentum; but such formations accompany general obesity, and do not come into the category of tumours. It is a fact that in man the largest lipomata usually occur in particularly lean individuals.

Osteomata are very generalised tumours; they have been met with in several species of fish. Gervais* has described many examples; reference has already been made to the singular condition of the bones in *Chætodon* (page 29). The bony outgrowths to which the term exostosis is applicable are of fairly common occurrence in mammals, and their frequency on the bones of horses can only be appreciated after a visit to a veterinary museum.

In regard to **odontomes,** it would, of course, be anticipated that such tumours occur more frequently in other mammals than in man, in consequence of the peculiar conditions of growth that prevail in such orders as *Rodentia* and *Proboscidea.*

* *Journal de Zoologie,* vol. iv., 1875.

The marmot, agouti, and porcupine have supplied me with very interesting specimens, and I have obtained as many as four large odontomes from the mouth of one marmot. Many excessively large odontomata have been obtained from horses and elephants. Goats, sheep, bears, and kangaroos have furnished me with excellent specimens of fibrous odontomes. Some of them are described in chapter iv.

Myomata furnish material for speculation. Probably the uterine myoma is the commonest tumour that affects the human female, but it is a singular fact that uterine myomata are almost unknown in mammals. The only specimen that has come under my observation occurred in a female baboon, and was rather a general enlargement of the uterus than an actual tumour.

Even among domestic mammals, such as the mare, cow, ewe, goat, bitch, and cat, uterine myomata are almost unknown; indeed, the details of the few recorded cases are stated in such vague terms that the descriptions are useless.

When the situations of uterine myomata in women come to be examined it will be seen that they are extremely common in the walls of the uterus, and they also grow from the cervix, but they are excessively rare, indeed almost unknown, in the Fallopian tube. In the majority of mammals the greater part of the uterus consists of two muscular tubes, the uterine cornua; whereas in women the tubes become confluent to form a median uterus. Seeing that myomata are common in the wall of this compound uterus, but almost unknown in the Fallopian tubes and in bicornuate uteri, it would seem to favour the view that uterine myomata may in some cases arise from "rests" in the uterine walls due to imperfect coalescence of the Müllerian ducts, in the same way that dermoids of the sequestration species are so common in the lines of coalescence in the embryo.

Of all the connective-tissue tumours, **sarcomata** have the widest zoological distribution, and they occur with very great frequency, especially the round-celled and the spindle-celled species. They are met with in fish, birds, rats, mice, horses, sheep, dogs, cats, goats, oxen, monkeys, bears, marsupials—indeed, in all the orders of mammals and in snakes. Sarcomata

in dogs often grow with extreme rapidity, and this may in some measure be explained by their elevated temperature (101·8° Fahr.).

Periosteum and skin appear to be the common situations attacked by sarcomata, especially in dogs. In horses and dogs I have been able to satisfy myself that spindle-celled sarcomata often contain hyaline cartilage. Retinal sarcomata have been observed in horses and sheep, and I have obtained an excellent specimen from the eye of a monkey. Melano-sarcomata in the horse have been already referred to on page 116.

Supposed sarcomata in the lower mammals, especially the lympho-sarcomata of dogs, need careful study from those engaged in bacteriology, for the rapid manner in which they grow and the profound effects they produce on the general health of these animals, suggests very strongly that they are the product of some very active species of micro-parasite.

The occurrence of **epithelial tumours** in animals, wild or domesticated, is a subject of great interest in its bearing on cancer and its allies. Unfortunately few trustworthy observations are forthcoming. For instance, a cursory review of veterinary periodical literature would give colour to the opinion that epithelioma of the penis is a common disease in bulls and in horses, but on looking into the matter a re-examination of suspected cases shows clearly enough that many supposed examples of epithelioma are, as a matter of fact, instances of penile warts, and all competent histologists who have inquired into the matter are unanimous that penile epithelioma in horses and bulls is excessively rare.

Warts are common enough in dogs and lambs, not only about the mouth and lips, but along the coronets of lambs and on the pads of the feet of dogs and many carnivora. Warts being abundant, it naturally follows that wart-horns would be frequent. This inference is confirmed by reference to examples described in chapter xx.

An extended inquiry concerning adenomata and carcinomata in mammals generally, reveals an extraordinary condition of things. Wild mammals in a state of nature and those living in confinement appear to be absolutely free from cancer.

On one occasion I found a mammary adenoma in a phalanger ; it is preserved in the museum of the Royal College of Surgeons, and this single specimen represents the extent of my knowledge concerning adenomata and cancers in wild mammals. It is fair to emphasise this statement by mentioning that during the eight years I was in close attendance in the Prosector's room of the Zoological Society's Gardens, I was particularly on the look-out for tumours of all kinds.

Adenomata occur in domestic mammals. The bitch is especially liable to tumours of the mammary gland that are analogous to the large cystic adenoceles of women. These tumours are sometimes so large as to exceed in weight the carcase of the bitch to which they are attached. As far as my observations extend, these tumours do not infect the lymph glands nor become disseminated. Large cystic adenomata, with intracystic processes, are occasionally seen in the udders of cows.

The mammary glands of cats are liable to a disease that is histologically identical with mammary cancer in women, but cancer such as attacks the human mamma is unknown in cows, mares, ewes, goats, or bitches.

Dogs are liable to a species of tumour that occurs with tolerable frequency in the skin around the anus. It exhibits the structure of a sebaceous adenoma and after attaining the size of a walnut ulcerates. Such tumours quickly recur after removal, but they do not, as a rule, infect the lymph glands or become disseminated.

Very little is known concerning the occurrence of **dermoids** in mammals. Considering the frequency of these tumours in man it might be imagined that they would be widely distributed among mammals. Of sequestration dermoids, a fair number of specimens have been obtained from sheep and oxen, but most of these belong to the implantation variety. (Page 305.)

Ovarian dermoids have been observed in the mare and the ewe. Dermoid patches on the conjunctiva have been reported many times in all species of domestic mammals except the ass and cat.

Teratomata are common enough among domestic animals, and many examples have been described in fish, frogs, and other batrachians, lizards, snakes, birds, rabbits, hares, etc.

The frequency of **cystic tumours** in vertebrata generally forms a striking contrast to the infrequency of connective-tissue and epithelial tumours. Such conditions as hydronephrosis, congenital cystic kidney, dilatations of the vitello-intestinal duct have been observed. Hydrocele of the tunica vaginalis is rare because the funicular pouch in mammals retains its connection with the general peritoneal cavity throughout life. Cysts arising in connection with the central nervous system have been observed in foals, pigs, and calves. Hydrocephalus is fairly frequent, but spina bifida is rare. Œsophageal diverticula are often seen in horses, and these useful mammals are exceedingly liable to synovial cysts and ganglia.

Parasitic cysts are very common in animals of all kinds.

CHAPTER LIII.

THE CAUSE OF TUMOURS.

It is a very difficult task to discuss the cause of tumours; nevertheless it is far easier to-day than it was fifty years ago. Pathological histology has taught us to narrow the term "tumour" within certain limits, and bacteriology has enabled us to reject many morbid conditions that were formerly called tumours.

Virchow rendered excellent service in separating the Infective Granulomata, and it was afterwards demonstrated that many of them—*e.g.*, tubercle, glanders, actinomycosis, etc.—are caused by micro-organisms. Another example of greater precision in the use of terms is furnished by hydatids; this name was formerly used in the loosest sense, but is now restricted to the cystic stage of *Tænia echinococcus*. Increased precision in the use of names may be expected to continue with the advance and diffusion of knowledge concerning tumours, and by degrees the name "tumour" will have a still narrower meaning. Recent investigations in the pathology of morbid growths teach us to look for a variety of causes. Take, for example, the interesting speculation usually termed Cohnheim's theory, in which tumours are supposed to spring from unutilised fragments of tissue, or residues, some of which may be due to faults or embryonic irregularities. Such residues or "tumour-germs" may, early in life, even in the fœtus, develop into tumours, or remain many months, or even years, quiescent, then suddenly, and apparently without provocation, take on active growth. This theory, unsupported as it was, without the least evidence of a concrete character, was advanced by Cohnheim as an explanation of the origin of connective-tissue and epithelial tumours. The great argument against it was to the effect that unutilised embryonic tissue (tumour-germs) had not been demonstrated. The theory, however, indicated a line of inquiry in which observation and experiment have demonstrated, in regard to some genera of connective-tissue tumours and very many dermoids, that it offers a solution of several difficult problems.

It is undeniable that our knowledge of unutilised tissue and vestiges of organs has of late years been widened, and it will be useful to summarise briefly what is now known in regard to them.

It is desirable to arrange tumour-germs in two groups—viz., vestiges and rests. The term **vestige** should be reserved for structures that are remnants of organs functional in vertebrates lower than man; for those organs that are of importance to the embryo, but useless in the adult; and a few which, though utilised in the male, are useless, or almost useless, in the female, and *vice versâ;* as well as for those structures which, as far as we know, serve no useful purpose in any vertebrate at present living, but were doubtless of importance in their ancestors. Many examples of vestiges and their relation to tumours have already been considered in the preceding pages—*e.g.*, the mesonephros, the parovarium Gartner's duct, the urachus, the vitello-intestinal duct, the central canal of the cord, etc.

The term **rests** should be reserved for detached fragments of glands and isolated portions of tissue and epithelium. That they are the sources of many tumours there can be no doubt, and it is equally certain that when more attention is devoted to the question, many additional examples of "rests" will come to light. The number already known is by no means insignificant.

The easiest demonstrable example occurs in connection with the **spleen.** It is the normal condition to find in the gastro-splenic omentum of a child at birth a miniature spleen or splenculus. It is no uncommon event to find two or three splenculi, and as many as five have been counted. In many instances these accessory spleens atrophy, but frequently they may be detected in adults. When the abdominal viscera are transposed the spleen is, as a rule, represented by a cluster of splenculi.

The **pancreas** furnishes a similar example. Several instances have been recorded in which an accessory pancreas has been detected. It is usually situated in the wall of the duodenum or jejunum, between the serous and muscular coats, and it is important to remember that these detached fragments may occur at some distance from the main gland. **Accessory**

thyroid glands—neglecting those which lie in the tract of the thyro-glossal duct—illustrate this, for they have been detected on a level with the episternal notch, and in the trachea as low as its bifurcation.

Rests associated with an **adrenal** occur in the kidney, immediately beneath the capsule, as cuneiform, yellowish-white nodules; they have been described as renal lipomata, and there is reason to believe that they are occasionally the germs of very large tumours. (*See* page 98.)

Detached fragments of **liver** occasionally occur in the falciform ligament and in the neighbourhood of the transverse fissure; but no one, so far as I know, has succeeded in demonstrating the origin of a tumour from these rests; but it is easily conceivable that they might under exceptionable conditions play the part of tumour-germs.

As fragmentary livers, so to speak, occur beyond the actual hepatic territory, it is very probable that portions of glandular tissue may be isolated within the liver itself, and there are strong grounds for the belief that certain adenomata of the liver do arise from such sequestrated tracts of hepatic tissue. This mode of origin of adenomata gains strongest support from our knowledge of mammary tumours. Outlying pieces of **mammary gland** are occasionally met with, merely joined to the main gland by connective tissue, and it is reasonable to believe that they are the source of some of the encapsuled adenomata that occur at the periphery of the breast. The mammary rests must not be confounded with **accessory mammæ** arising as **neomorphs** in the adjacent skin, especially in the skin of the axilla. It is also probable that isolated encapsuled portions of gland are the source of the fibro-adenomata so common in the mammæ of young women. (*See* page 221.) The same explanation holds good for some of the small cystic tumours of the **parotid gland.**

Tracts of epithelium occur as vestiges and as rests. As vestiges, epithelial tracts occur in the tongue—the lingual duct; in the neck—branchial clefts; in the naso-palatine suture—Stenson's canal; in the brain—infundibulum; and in other situations the vestigial character of some of the tracts and their tendency to form tumours has been already described. The tumour-forming proclivities of

others has been abundantly demonstrated in the section on Dermoids.

As rests, epithelial tracts occur in the line of the meso-palatine suture, in the gums derived from enamel-organs, and in the lines of coalescence of the trunk, the scalp and face. In these situations they give rise to tumours. Epithelial rests may be produced accidentally by surface epithelium carried into the deeper tissues by cuts, punctures, etc. These give rise to small tumours, when the conditions are favourable, known as implantation cysts. (*See* page 304 and Fig. 250.)

Rests are known in connection with non-epithelial tissues, but they do not admit of such ready demonstration. In the neighbourhood of epiphysial lines, particularly in the long bones of rickety individuals, islets of cartilage have long been known, and it is not unreasonable to believe that such belated fragments may be the source of some enchondromata and osteomata.

It is certainly probable that some forms of uterine myomata arise from sequestrated portions of the uterine tissue, especially encapsuled myomata of the uterine walls. (*See* page 488.)

It is curious that many vestiges and rests lie latent several years. Take, for example, accessory thyroids: rarely they give trouble before puberty; many never cause the least inconvenience, and a few become active even late in life. Goitre of the parenchymatous kind is occasionally congenital; but I am not aware that the cystic variety is common until the accession of puberty; after this event it is frequent. Mammary adenomata are of common occurrence between the sixteenth and thirtieth years, but they are almost unknown before the fourteenth year. The best instance of this sudden awakening may be studied in the parovarium; its ducts are quiescent during the early years of life. So far as I have collected the evidence—and my search has been a broad one—there is no case on record of a parovarian cyst occurring in a girl under fifteen years. Between the ages of sixteen and twenty-five years a large number of parovarian cysts have been removed.

Take cysts of the paroöphoron: they are almost unknown before the twenty-fifth year of life. Certain it is that small paroöphoritic cysts have been detected in infant ovaries, but

these were not appreciable to clinical observation. The existence of tumour-germs is demonstrable in the case of cysts. There is scarcely a cyst known to which pathologists cannot ascribe an origin in some pre-existing duct, tube, gland, or vestige. One of the most extraordinary features connected with some cysts is the physiology of secretion. For instance, a parovarian, or a simple ovarian cyst containing only two or three ounces of fluid in a tense sac with thin walls, may in spite of the intracystic pressure continue to increase until it attains a capacity of three, four, or more gallons. Hydrocephalus and meningoceles illustrate the same inexplicable phenomenon, for they are devoid of glands and lack epithelium, at least in their late stages.

In the case of simple tumours we know that they arise from a matrix similar in structure to the tumour. These facts should cause us to keep a keener look-out for isolated fragments (rests) of organs and tissues. A very suggestive instance is a fatty tumour of the broad ligament of the uterus. Under normal conditions there is no fat between the layers of this serous ligament, yet lipomata have been observed in that situation, sometimes of great size. A careful examination of the parts has taught me that the parovarium is sometimes buried in a layer of rich yellow fat.

The tumours to which Cohnheim's theory cannot be regarded as in any sense applicable are the sarcomata, epitheliomata, and cancers.

Although Cohnheim's theory of tumours concerns a limited number of genera, it commands attention because it is in itself a brilliant generalisation, and has served a valuable purpose in directing inquiry upon particular lines, which has led to a great extension of knowledge in regard to vestiges and rests.

Before discussing the probable cause of **cancer** it is necessary to consider some points in its morphology. A comprehensive study of the histology of cancer indicates that the method of dividing it into three varieties—scirrhus, encephaloid (medullary), and colloid—is not only misleading, but the division has no structural basis. It is also of great importance to bear in mind that many misconceptions arise from the circumstance, that pathologists have been in the habit of interpreting the structure of cancers from plane

sections, without in the least taking into consideration the relation of a given section to the entire tumour; hence a scirrhous cancer was said to be composed of an alveolar meshwork of fibrous tissue, the alveoli enclosing epithelial cells. If, instead of drawing conclusions from one or two sections selected haphazard, a number of consecutive sections be taken and a composite picture framed from them, it will at once become clear that the cellular alveoli are sections of glandular acini and ducts filled with cells cut in various directions, some transverse, others oblique, and many in their long axes. This fact is admirably illustrated in the case of rectal cancer; frequently sections of these tumours take the form of closely packed cylinders. In others a number of epithelium-lined bays or recesses are found, and in some parts of the tumour these spaces are of irregular shape and embedded in young connective tissue. When the sections are examined collectively we find that these alveoli with their epithelial contents are really greatly enlarged Lieberkühnian follicles cut in various planes. What is true of the rectum holds equally for the mammary gland, the prostate, the mucous membrane of the stomach, and the uterus. Of all organs in the body none illustrate the relation of cancer to glands so well as the uterus, for cancer of the cervical canal is constructed on the type of the glands normally found in the mucous membrane lining it; cancer of the body of the uterus is constructed on the type of the uterine glands. Thus cancer of this organ alone offers sufficient evidence that the notion of cancer in general conforming to three types must be cast aside. Even the most conservative surgeons will find little difficulty in rejecting the old misleading terminology, for it has long been known that adenomata absolutely conform in structure to the glands in which they arise, and as cancer is best described as **malignant adenoma,** there will be little difficulty in perceiving why the type of structure is maintained. This *preservation of the type of structure* is well illustrated in other mammals where adenomata are also structural repetitions of the glands in which they arise.

A correct appreciation of the morphology of adenomata and carcinomata is of the first importance as a prelude to the study of the cause of cancer. The ducts of all secreting

glands open on free surfaces and are therefore accessible to minute organisms which may be contained in the air, in food, and in water. It is therefore conceivable that such bodies may gain entrance into the ducts and find their way thence into the recesses of the glands and give rise to such changes as manifest themselves as cancer. So far all this is problematical, for no one has succeeded in demonstrating satisfactorily

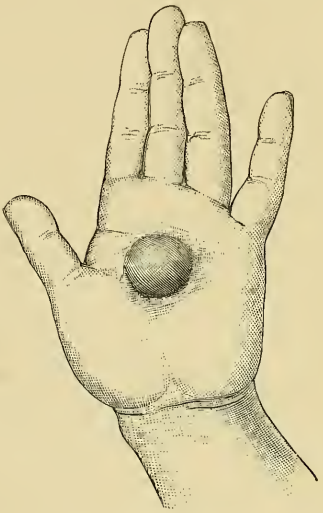

Fig. 250.—Cyst (implantation) of the palm. (*Kummer.*)

the presence of a specific parasite in those tumours which correspond to the definition of a cancer as laid down in this book.

That parasites find their way into glands is well known—*e.g.*, the *demodex*, so common in the sebaceous glands of the skin, and the *coccidium oviforme*, which infests the bile-ducts in rabbits and produces adenomatous-like nodules in the liver. In this last case it would appear that the coccidia are admitted with food into the alimentary canal, and invade the liver by the common bile duct. But there is this important fact: in the rabbit no one has demonstrated that these coccidia nodules become disseminated over the body and produce secondary tumours in the bones, brain, lungs, ovaries, and elsewhere. This is one of the characteristic features of cancer. To find a tumour in the body of a vertebra, or in the shaft of

the humerus, reproducing all the structural features of a rectal, thyroid, or prostate gland, is one of the most surprising phenomena in the whole range of pathology. The vitality of epithelium is very great, and its capability of growth when transplanted has been demonstrated experimentally in addition to the evidence furnished by observations on peritoneal warts and implantation cysts (Fig. 250). We may be prepared to find that a colony of tubercle bacilli will, when lodged in the calcaneum, give rise to lesions identical with those found associated with these bacilli in muscles, the brain, or lymph glands, as each of them contains connective tissue; but to find a secondary nodule containing rich, regular columnar epithelium exactly reproducing the structure of the primary tumour in situations where there is no epithelium normally, is at present inexplicable on the theory that cancer is due to coccidia, and it becomes more so to find that secondary nodules of cancer in the liver do not caricature the hepatic cells, but are faithful reproductions of the primary tumour, as certain as a fertilised ovum, if it completely develops, will reproduce an animal like to the animal from whose ovary it issued.

There are many facts indicating that cancer is induced by minute parasites, for those glands which are in most direct communication with the air or intestinal gases are most prone to become cancerous—*e.g.*, the breast, rectum, and stomach; whereas cancer of the prostate and thyroid gland is, in England, at least, rare.

The great frequency of cancer of the cervical canal of the uterus in comparison with its rarity in the body of that organ is another case in point. These are all significant facts in relation to parasitic invasion.

The opinion that all varieties of cancer are due to one cause I cannot entertain. Assuming cancer to be the product of such agents as produce tubercle, glanders, or actinomycosis, it is much more probable that under the term cancer, even with the limitation imposed upon it in this book, many tumours are grouped together, on account of structural likeness, that have a widely different cause, and the same view holds for sarcomata and epitheliomata.

Of all the tumours that affect the human body, the most

mysterious are the **melanomata,** and especially those which arise in pigmented moles.

I have not deemed it necessary to discuss injury (trauma) as a cause of tumours. Cohnheim has ably disproved this in the famous lecture on tumours in his "Vorlesungen über allgemeine Patholgie," 1877-78.

It is a noteworthy fact that most pathologists who have taken comprehensive views of tumour formation, and have made it the subject of serious and prolonged study, are of opinion that tumours innocent and malignant are, in the beginning, local troubles, and that the safest and most effectual method of dealing with them may be expressed in one short sentence:—

THOROUGH REMOVAL OF THE TUMOUR, WHENEVER THIS IS POSSIBLE, AT THE EARLIEST POSSIBLE MOMENT.

THE END.

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